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LED LCD TV SERVICE MANUAL

CHASSIS: LD22E

MODEL: 47LM620S/620T/625S

47LM620S/620T-ZE 47LM625S-ZG

CAUTION

BEFORE SERVICING THE CHASSIS, READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



P/NO : MFL67360913 (1203-REV00) Printed in Korea

CONTENTS

CONTENTS 2	2
SAFETY PRECAUTIONS	3
SERVICING PRECAUTIONS	4
SPECIFICATION	6
ADJUSTMENT INSTRUCTION 10	0
SCREW ASSEMBLY WORKING GUIDE 18	8
BLOCK DIAGRAM19	9
EXPLODED VIEW 20	0
SCHEMATIC CIRCUIT DIAGRAM	

SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by \triangle in the Schematic Diagram and Exploded View.

It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.

Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and it's components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.

If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 $M\Omega$ and 5.2 $M\Omega.$

When the exposed metal has no return path to the chassis the reading must be infinite.

An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.

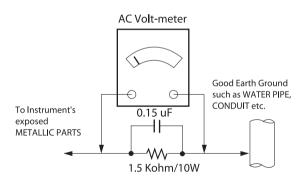
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.

Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which is corresponds to 0.5 mA.

In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω *Base on Adjustment standard

SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the *SAFETY PRECAUTIONS* on page 3 of this publication. *NOTE*: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

- Always unplug the receiver AC power cord from the AC power source before;
 - Removing or reinstalling any component, circuit board module or any other receiver assembly.
 - Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
 - c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
 - **CAUTION**: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
- Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe.
 Do not test high voltage by "drawing an arc".
- Do not spray chemicals on or near this receiver or any of its assemblies.
- 4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength) CAUTION: This is a flammable mixture.
 - Unless specified otherwise in this service manual, lubrication of contacts in not required.
- 5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
- Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
- Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
 - Always remove the test receiver ground lead last.
- 8. Use with this receiver only the test fixtures specified in this service manual.
 - **CAUTION**: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.

- After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
- Use only a grounded-tip soldering iron to solder or unsolder ES devices.
- Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
- 5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
- 6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
- Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
- **CAUTION**: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
- Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

- Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500 °F to 600 °F.
- Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
- 3. Keep the soldering iron tip clean and well tinned.
- Thoroughly clean the surfaces to be soldered. Use a mall wirebristle (0.5 inch, or 1.25 cm) brush with a metal handle.
 Do not use freon-propelled spray-on cleaners.
- 5. Use the following unsoldering technique
 - a. Allow the soldering iron tip to reach normal temperature. (500 $^{\circ}\text{F}$ to 600 $^{\circ}\text{F}$)
 - b. Heat the component lead until the solder melts.
 - c. Quickly draw the melted solder with an anti-static, suctiontype solder removal device or with solder braid.
 CAUTION: Work quickly to avoid overheating the circuit board printed foil.
- 6. Use the following soldering technique.
 - a. Allow the soldering iron tip to reach a normal temperature (500 $^{\circ}$ F to 600 $^{\circ}$ F)
 - b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
 - c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
 - **CAUTION**: Work quickly to avoid overheating the circuit board printed foil.
 - d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

IC Remove/Replacement

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal

- Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
- Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC

Replacement

- 1. Carefully insert the replacement IC in the circuit board.
- Carefully bend each IC lead against the circuit foil pad and solder it
- 3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete Transistor Removal/Replacement

- Remove the defective transistor by clipping its leads as close as possible to the component body.
- Bend into a "U" shape the end of each of three leads remaining on the circuit board.
- 3. Bend into a "U" shape the replacement transistor leads.
- 4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device

Removal/Replacement

- 1. Heat and remove all solder from around the transistor leads.
- 2. Remove the heat sink mounting screw (if so equipped).
- Carefully remove the transistor from the heat sink of the circuit board.
- 4. Insert new transistor in the circuit board.
- 5. Solder each transistor lead, and clip off excess lead.
- 6. Replace heat sink.

Diode Removal/Replacement

- Remove defective diode by clipping its leads as close as possible to diode body.
- Bend the two remaining leads perpendicular y to the circuit board.
- 3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
- 4. Securely crimp each connection and solder it.
- Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor

Removal/Replacement

- Clip each fuse or resistor lead at top of the circuit board hollow stake.
- 2. Securely crimp the leads of replacement component around notch at stake top.

3. Solder the connections.

CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections)

- 1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
- carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
- 3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
- 4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

- Remove the defective copper pattern with a sharp knife.
 Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
- Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
- Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side.

Carefully crimp and solder the connections.

CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

SPECIFICATION

NOTE: Specifications and others are subject to change without notice for improvement.

1. Application range

This specification is applied to the LCD TV used LD22E chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

- 1) Temperature: 25 °C \pm 5 °C(77 °F \pm 9 °F), CST: 40 °C \pm 5 °C
- 2) Relative Humidity: 65 % ± 10 %
- 3) Power Voltage
 - : Standard input voltage (AC 100-240 V~, 50/60 Hz)
 - * Standard Voltage of each products is marked by models.
- 4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
- 5) The receiver must be operated for about 20 minutes prior to the adjustment.

3. Test method

- 1) Performance: LGE TV test method followed
- 2) Demanded other specification
 - Safety : CE, IEC specification
 - EMC : CE. IEC
 - Wireless: Wireless HD Specification (Option)

4. Model General Specification

No.	Item	Specification	Remarks
1	Market	EU(PAL Market-36Countries)	DTV & Analog (Total 37 countries) DTV (MPEG2/4, DVB-T): 30 countries Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ire- land, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus DTV (MPEG2/4, DVB-T2): 7 countries UK, Sweden, Denmark, Finland, Norway, Ukraine, Kaza- khstan, Ireland DTV (MPEG2/4, DVB-C): 37 countries Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ire- land, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan DTV (MPEG2/4,DVB-S): 30 countries Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ire- land, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus Supported satellite: 22 satellites HISPASAT 1C/1D, ATLANTIC BIRD 2, NILESAT 101/102, ATLANTIC BIRD 3, AMOS 2/3, THOR 5/6, IRIUS 4, EU- TELSAT-W3A, EUROBIRD 9°, EUTELSAT-W2A, HOTBIRD 6/8/9, EUTELSAT-SESAT, ASTRA 1L/H/M/KR, ASTRA 3°/3B, BADR 4/6, ASTRA 2D, EUROBIRD 3, EUTELSAT- W7, HELLASSAT 2, EXPRESS AM1, TURKSAT 2°/3°, INTERSAT10

No.	Item	Specification	Remarks
2	Broadcasting system	1) PAL-BG 2) PAL-DK 3) PAL-I/I' 4) SECAM L/L', DK, BG, I 5) DVB-T 6) DVB-C 7) DVB-T2 8) DVB-S	DVB-S: Satellite
3	Receiving system	Analog : Upper Heterodyne Digital : COFDM, QAM	 DVB-T - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32 - Modulation: Code Rate QPSK: 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM: 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM: 1/2, 2/3, 3/4, 5/6, 7/8 DVB-T2 - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256, - Modulation: Code Rate QPSK: 1/2, 2/5, 2/3, 3/4, 5/6 16-QAM: 1/2, 2/5, 2/3, 3/4, 5/6 64-QAM: 1/2, 2/5, 2/3, 3/4, 5/6 256-QAM: 1/2, 2/5, 2/3, 3/4, 5/6 DVB-C - Symbolrate: 4.0Msymbols/s to 7.2Msymbols/s - Modulation: 16QAM, 64-QAM, 128-QAM and 256-QAM DVB-S/S2 - symbolrate DVB-S/S2 - symbolrate DVB-S/S2 (8PSK / QPSK): 2 ~ 45Msymbol/s DVB-S (QPSK): 2 ~ 45Msymbol/s - viterbi DVB-S mode: 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 mode: 1/2, 2/3, 3/4, 5/6, 7/8
4	Scart Gender Jack (1EA)	PAL, SECAM	Scart jack is Full scart and support MNT/DTV-OUT (not support DTV Auto AV)
5	Video Input RCA(1EA)	PAL, SECAM, NTSC	4 System : PAL, SECAM, NTSC, PAL60 AV gender jack 1EA
6	Head phone out	Antenna, AV1, AV2, Component, RGB, HDMI1, HDMI2, HDMI3, HDMI4, USB1, USB2, USB3	
7	Component Input (1EA)	Y/Cb/Cr Y/Pb/Pr	Component Gender 1EA
8	RGB Input	RGB-PC	Analog(D-SUB 15PIN)
9	HDMI Input (4EA)	HDMI1-DTV HDMI2-DTV HDMI3-DTV HDMI4-DTV	HDMI4 : PC support(HDMI version 1.3) Support HDCP
10	Audio Input (3EA)	RGB/DVI Audio Component AV	L/R Input
11	SPDIF out (1EA)	SPDIF out	
12	USB (3EA)	EMF, DivX HD, For SVC (download)	JPEG, MP3, DivX HD
	Ethernet Connect(1EA)	Ethernet Connect	

5. Component Video Input (Y, CB/PB, CR/PR)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	Porposed
1	720×480	15.73	60.00	SDTV, DVD 480i
2	720×480	15.63	59.94	SDTV, DVD 480i
3	720×480	31.47	59.94	480p
4	720×480	31.50	60.00	480p
5	720×576	15.625	50.00	SDTV, DVD 625 Line
6	720×576	31.25	50.00	HDTV 576p
7	1280×720	45.00	50.00	HDTV 720p
8	1280×720	44.96	59.94	HDTV 720p
9	1280×720	45.00	60.00	HDTV 720p
10	1920×1080	31.25	50.00	HDTV 1080i
11	1920×1080	33.75	60.00	HDTV 1080i
12	1920×1080	33.72	59.94	HDTV 1080i
13	1920×1080	56.250	50	HDTV 1080p
14	1920×1080	67.5	60	HDTV 1080p

6. RGB input (PC)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Proposed
1	640 x 350 @70Hz	31.468	70.09	EGA
2	720 x 400 @70Hz	31.469	70.08	DOS
3	640 x 480 @60Hz	31.469	59.94	VESA(VGA)
4	800 x 600 @60Hz	37.879	60.31	VESA(SVGA)
5	1024 x 768 @60Hz	48.363	60.00	VESA(XGA)
6	1152 x 864 @60Hz	54.348	60.053	VESA
7	1360 x 768 @60Hz	47.712	60.015	VESA(WXGA)
8	1920 x 1080 @60Hz	67.5	60.00	WUXGA(Reduced Blanking))

7. HDMI Input 7.1. DTV mode

No.	Resolution	H-freq(kHz)	V-freq.(kHz)	Proposed
1.	640*480	31.469 / 31.5	59.94/60	SDTV 480P
2.	720*480	31.469 / 31.5	59.94 / 60	SDTV 480P
3.	720*576	31.25	50	SDTV 576P
4.	720*576	15.625	50	SDTV 576I
5.	1280*720	37.500	50	HDTV 720P
6.	1280*720	44.96 / 45	59.94 / 60	HDTV 720P
7.	1920*1080	33.72 / 33.75	59.94 / 60	HDTV 1080I
8.	1920*1080	28.125	50.00	HDTV 1080I
9.	1920*1080	26.97 / 27	23.97 / 24	HDTV 1080P
10.	1920*1080		25	HDTV 1080P
11.	1920*1080	33.716 / 33.75	29.976 / 30.00	HDTV 1080P
12.	1920*1080	56.250	50	HDTV 1080P
13.	1920*1080	67.43 / 67.5	59.94 / 60	HDTV 1080P

7.2. PC mode

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Proposed
1	640 x 350 @70Hz	31.468	70.09	EGA
2	720 x 400 @70Hz	31.469	70.08	DOS
3	640 x 480 @60Hz	31.469	59.94	VESA(VGA)
4	800 x 600 @60Hz	37.879	60.31	VESA(SVGA)
5	1024 x 768 @60Hz	48.363	60.00	VESA(XGA)
6	1152 x 864 @60Hz	54.348	60.053	VESA
7	1280 x 1024 @60Hz	63.981	60.020	VESA(SXGA)
8	1360 x 768 @60Hz	47.712	60.015	VESA(WXGA)
9	1920 x 1080 @60Hz	67.5	60.00	WUXGA(Reduced Blanking))

ADJUSTMENT INSTRUCTION

1. Application Range

This specification sheet is applied to all of the LED LCD TV with LD22E chassis.

2. Designation

- (1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
- (2) Adjustment must be done in the correct order.
- (3) The adjustment must be performed in the circumstance of 25 $^{\circ}$ C \pm 5 $^{\circ}$ C of temperature and 65 $^{\circ}$ \pm 10 $^{\circ}$ 0 of relative humidity if there is no specific designation.
- (4) The input voltage of the receiver must keep AC 100-240 V~. 50/60 Hz.
- (5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15

In case of keeping module is in the circumstance of 0 $^{\circ}$ C, it should be placed in the circumstance of above 15 $^{\circ}$ C for 2 hours.

In case of keeping module is in the circumstance of below -20 °C, it should be placed in the circumstance of above 15 °C for 3 hours.

[Caution]

When still image is displayed for a period of 20 minutes or longer (Especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area.

3. Automatic Adjustment

3.1. ADC Adjustment

3.1.1. Overview

ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation.

3.1.2. Equipment & Condition

- (1) USB to RS-232C Jig
- (2) MSPG-925 Series Pattern Generator(MSPG-925FA, pattern - 65)
 - Resolution : 1080P Comp1 1920*1080 RGB
 - Pattern : Horizontal 100% Color Bar Pattern
 - Pattern level: 0.7 ± 0.1 Vp-p
 - Image



3.1.3. Adjustment

- (1) Adjustment method
 - Don't need to adjust ADC because there is data in OTP and adjusted initially.
 - Check ADC adjustment
 - Press In start key on the Adj. Remote Control, then Adjust ADC(OTP) status is displayed on "1.Adjustment check". Select "2.ADC Data", then ADC data is displayed.
 - 2) Press Adj. key on the Adjustmetn Remote Control, and select "9.ADC Calibration". Set up the ADC Type to OTP, then Select [Start] button by pressing Enter key, Component and RGB are Writed and display Success or NG.

(2) Adj. protocol

Protocol	Command	Set ACK
Enter adj. mode	aa 00 00	a 00 OK00x
Cauras abanas	xb 00 04	b 00 OK04x (Adjust 480i, 1080p Comp1)
Source change	xb 00 06	b 00 OK06x (Adjust 1920*1080 RGB)
Begin adj.	ad 00 10	
Return adj. result		OKx (Case of Success) NGx (Case of Fail)
	(main) ad 00 20	(main) 000000000000000000000000000000000000
Read adj. data	(sub)	(Sub)
	ad 00 21	000000070000000000000000007c00830077x
Confirm adj.	ad 00 99	NG 03 00x (Fail) NG 03 01x (Fail) NG 03 02x (Fail) OK 03 03x (Success)
End adj.	aa 00 90	a 00 OK90x

Ref.) ADC Adj. RS232C Protocol_Ver1.0

(3) Adj. order

- aa 00 00 [Enter ADC adj. mode]
- xb 00 04 [Change input source to Component1 (480i& 1080p)]
- ad 00 10 [Adjust 480i&1080p Comp1]
- xb 00 06 [Change input source to RGB(1024*768)]
- ad 00 10 [Adjust 1920*1080 RGB]
- ad 00 90 End adj.

3.2. MAC address D/L, CI+ key D/L, Widevine key D/L, ESN D/L

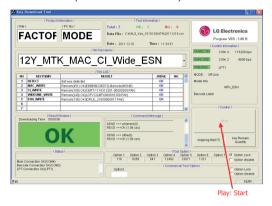
Connect: USB port

Communication Prot connection

• Com 1,2,3,4 and 115200(Baudrate)

Mode check: Online Only

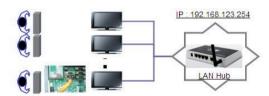
- check the test process: DETECT -> MAC -> CI -> Widevine -> ESN
- . Play: START
- . Result: Ready, Test, OK or NG
- . Printer Out (MAC Address Label)



3.3. LAN

3.3.1. Equipment & Condition

■ Each other connection to LAN Port of IP Hub and Jig



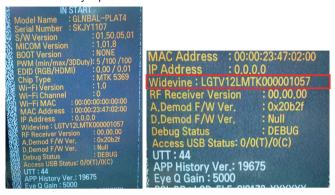
3.3.2. LAN inspection solution

- LAN Port connection with PCB
- Network setting at MENU Mode of TV
- Setting automatic IP
- Setting state confirmation
- → If automatic setting is finished, you confirm IP and MAC Address.



3.3.3. WIDEVINE key Inspection

- Confirm key input data at the "IN START" MENU Mode.



3.4. LAN PORT INSPECTION(PING TEST)

Connect SET → LAN port == PC → LAN Port



3.4.1. Equipment setting

- (1) Play the LAN Port Test PROGRAM.
- (2) Input IP set up for an inspection to Test Program.
 *IP Number : 12.12.2.2

3.4.2. LAN PORT inspection(PING TEST)

- (1) Play the LAN Port Test Program.
- (2) Connect each other LAN Port Jack.
- (3) Play Test (F9) button and confirm OK Message.
- (4) Remove LAN cable.



3.5. Model name & Serial number Download

3.5.1. Model name & Serial number D/L

- Press "Power on" key of service remote control. (Baud rate: 115200 bps)
- Connect RS232 Signal Cable to RS-232 Jack.
- · Write Serial number by use RS-232.
- Must check the serial number at Instart menu.

3.5.2. Method & notice

- (1) Serial number D/L is using of scan equipment.
- (2) Setting of scan equipment operated by Manufacturing Technology Group.
- (3) Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0
- * Manual Download (Model Name and Serial Number)
 If the TV set is downloaded by OTA or service man, sometimes
 model name or serial number is initialized.(Not always)
 It is impossible to download by bar code scan, so It need
 Manual download.
- 1) Press the "Instart" key of Adjustment remote control.
- 2) Go to the menu "5.Model Number D/L" like below photo.
- 3) Input the Factory model name(ex 47LM760S-ZB-A) or Serial number like photo.



- Check the model name Instart menu. → Factory name displayed. (ex 47LM760S-ZB)
- 5) Check the Diagnostics.(DTV country only) → Buyer model displayed. (ex 47LM760S-ZB)

3.6. CI+ Key checking method

- Check the Section 3.2

Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).



=> Check the Download to CI+ Key value in LGset.

3.6.1. Check the method of CI+ Key value

- (1) Check the method on Instart menu
- (2) Check the method of RS232C Command
 - 1) Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
Α	А	0 0	

2) Check the key download for transmitted command (RS232: ci 00 10)

CMD 1	CMD 2	Data 0	
С	I	1	0

3) Result value

- Normally status for download : OKx - Abnormally status for download : NGx

3.6.2. Check the method of CI+ key value(RS232)

1) Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
Α	Α	0	0

2) Check the mothed of CI+ key by command (RS232: ci 00 20)

CMD 1	CMD 2	Data 0	
С	I	2 0	

3) Result value

i 01 OK 1d1852d21c1ed5dcx

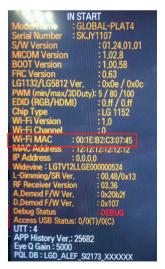
CI+ Kev Value

3.7. WIFI MAC ADDRESS CHECK

(1) Using RS232

· , ,		
	H-freq(kHz)	V-freq.(Hz)
Transmission	[A][I][][Set ID][][20][Cr]	[O][K][X] or [NG]

(2) Check the menu on in-start.



4. Manual Adjustment

* ADC adjustment is not needed because of OTP(Auto ADC adjustment)

4.1 EDID(The Extended Display Identification Data)/DDC(Display Data Channel) download

4.1.1. Overview

It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of "Plug and Play".

4.1.2. Equipment

- Since embedded EDID data is used, EDID download JIG, HDMI cable and D-sub cable are not need.
- Adjustment remote control

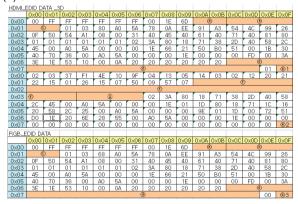
4.1.3. Download method

- (1) Press "ADJ" key on the Adjustment remote control then select "10.EDID D/L", By pressing "Enter" key, enter EDID D/L menu.
- (2) Select "Start" button by pressing "Enter" key, HDMI1/ HDMI2/ HDMI3/ HDMI4/ RGB are writing and display OK or NG.

01 140.						
For Analog	For HDMI EDID					
D-sub to D-sub	DVI-D to HDMI or HDMI to HDMI					

4.1.4. EDID DATA

(1) 3D EDID DATA



Reference

- HDMI1 ~ HDMI4 / RGB
- In the data of EDID, bellows may be different by S/W or Input mode.

(a). Product ID

HEX	EDID Table	DDC Function			
0001	01 00	Analog/Digital			

- **b**. Serial No: Controlled on production line.
- ©. Month, Year: Controlled on production line:

ex) Week : '01' -> '01' Year : '2012' -> '16' fix @. Model Name(Hex): LGTV

Chassis	MODEL NAME(HEX)
LD22E	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20

(e). Checksum: Changeable by total EDID data.

	@1	©2 10 bit/ Xvycc	⊚2 8 bit/ Xvycc	©210 bit/none XvYcc	©28 bit/none XvYcc	@ 3
HDMI1	43	11	49	15	4D	Х
HDMI2	43	01	39	05	3D	Χ
HDMI3	43	F1	29	F5	2D	Χ
HDMI4	43	E1	19	E5	1D	Χ
RGB	Х	Х	Х	Х	Х	5C

f. Vendor Specific(HDMI)

1) Deep color (module 10bit)

	INPUT	MODEL NAME(HEX)										
	HDMI1	78 03 0C 00 10 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10										
ſ	HDMI2	78 03 0C 00 20 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10										
	HDMI3	78 03 0C 00 30 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10										
	HDMI4	78 03 0C 00 40 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10										

2) None deep color (module 8bit)

INPUT	MODEL NAME(HEX)							
HDMI1	78 03 0C 00 10 00 80 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10							
HDMI2	78 03 0C 00 20 00 80 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10							
	78 03 0C 00 30 00 80 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10							
HDMI4	78 03 0C 00 40 00 80 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10							

- The Model supporting XvYcc(LM7600)

	• • •
INPUT	MODEL NAME(HEX)
HDMI1	E3 05 00 00
HDMI2	E3 05 00 00
HDMI3	E3 05 00 00
HDMI4	E3 05 03 01

4.2. White Balance Adjustment

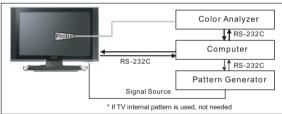
4.2.1. Overview

- W/B adj. Objective & How-it-works
- (1) Objective: To reduce each Panel's W/B deviation
- (2) How-it-works: When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
- (3) Adjustment condition : normal temperature 1) Surrounding Temperature : 25 °C ± 5 °C
 - 2) Warm-up time: About 5 Min
 - 3) Surrounding Humidity : 20 % \sim 80 %

4.2.2. Equipment

- (1) Color Analyzer: CA-210 (LED Module: CH 14)
- (2) Adjustment Computer(During auto adj., RS-232C protocol is needed)
- (3) Adjustment Remote control
- (4) Video Signal Generator MSPG-925F 720p/204-Gray (Model: 217, Pattern: 49)
 - -> Only when internal pattern is not available
- Color Analyzer Matrix should be calibrated using CS-100.

4.2.3. Equipment connection MAP



4.2.4. Adj. Command (Protocol)

<Command Format>

START	65	Λ.	50	Ι Λ	I ENI	١.	U3	١ ۸	CMD	Λ	nn	۸.	1//1	Λ.	00	QTOD
OIMINI	ᇇᆫ	\sim	00	_ ^		_ ^	UJ	_ ^	CIVID	_ ^	00	_ ^	I VAL	_ ^		3101

- LEN: Number of Data Byte to be sent
- CMD: Command
- VAL: FOS Data value
- CS: Checksum of sent data
- A: Acknowledge
- Ex) [Send: JA_00_DD] / [Ack: A_00_okDDX]

RS-232C Command used during auto-adjustment.

RS-23	32C COM	MAND	Fundantian
[CMD	ID	DATA]	Explantion
wb	00	00	Begin White Balance adjustment
wb	00	10	Gain adjustment(internal white pattern)
wb	00	1f	Gain adjustment completed
wb	00	20	Offset adjustment(internal white pattern)
wb	00	2f	Offset adjustment completed
wb	00	ff	End White Balance adjustment (internal pattern disappears)

Ex) wb 00 00 -> Begin white balance auto-adj.
wb 00 10 -> Gain adj.
ja 00 ff -> Adj. data
jb 00 c0
...
wb 00 1f → Gain adj. completed
*(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.
wb 00 ff → End white balance auto-adj.

- Adj. Map

	Adj. item	Command (lower caseASCII			Range ex.)	Default (Decimal)
		CMD1	CMD2	MIN	MAX	
	R Gain	j	g	00	C0	
	G Gain	j	h	00	C0	
Cool	B Gain	j	i	00	C0	
Cool	R Cut					
	G Cut					
	B Cut					
	R Gain	j	а	00	C0	
	G Gain	j	b	00	C0	
Medium	B Gain	j	С	00	C0	
Iviediuiii	R Cut					
	G Cut					
	B Cut					
	R Gain	j	d	00	C0	
	G Gain	j	е	00	C0	
Warm	B Gain	j	f	00	C0	
	R Cut					
	G Cut					

4.2.5. Adj. method

- (1) Auto adj. method
 - 1) Set TV in adj. mode using P-Only key.
 - Zero calibrate probe then place it on the center of the Display.
 - 3) Connect Cable.(RS-232C to USB)
 - 4) Select mode in adj. Program and begin adj.
 - 5) When adj. is complete (OK Sign), check adj. status pre mode. (Warm, Medium, Cool)
 - 6) Remove probe and RS-232C cable to complete adj.
 - W/B Adj. must begin as start command "wb 00 00", and finish as end command "wb 00 ff", and Adj. offset if need.
- (2) Manual adjustment. method
 - 1) Set TV in Adj. mode using P-Only key.
 - Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10 cm of the surface.
 - Press ADJ key → EZ adjust using adj. R/C → 7. White-Balance then press the cursor to the right(key ►).
 (When right key(►) is pressed 216 Gray internal pattern will be displayed)
 - 4) One of R Gain / G Gain / B Gain should be fixed at 192, and the rest will be lowered to meet the desired value.
 - 5) Adjustment is performed in COOL, MEDIUM, WARM 3 modes of color temperature.
 - If internal pattern is not available, use RF input. In EZ Adj. menu 7.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 216 Gray pattern.

- Adjustment condition and cautionary items
 - Lighting condition in surrounding area Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
 - 2) Probe location
 - : Color Analyzer(CA-210) probe should be within 10 cm and perpendicular of the module surface.(80° ~ 100°)
 - 3) Aging time
 - After Aging Start, Keep the Power ON status during 5 Minutes
 - In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

4.2.6. Reference(White balance adjusmment coordinate and color temperature)

- Luminance: 204 Gray
- Standard color coordinate and temperature using CS-1000 (over 26 inch)

	(
	Mada	Coord	dinate	Tomas	Δuv	
	Mode	Х	у	Temp		
	Cool	0.269	0.273	13000 K	0.0000	
	Medium	0.285	0.293	9300 K	0.0000	
	Warm	0.313	0.329	6500 K	0.0000	

Standard color coordinate and temperature using CA-210(CH 14)

Mode	Coor	Temp	Λuv	
Mode	x	у	Temp	Δυν
Cool	0.269 ± 0.002	0.273 ± 0.002	13000 K	0.0000
Medium	0.285 ± 0.002	0.293 ± 0.002	9300 K	0.0000
Warm	0.313 ± 0.002	0.329 ± 0.002	6500 K	0.0000

4.2.7. LED White balance table

- EDGE LED module change color coordinate because of aging time.
- Apply under the color coordinate table, for compensated aging time.
- ALEF(LM76 series)

	Aging	Cool		Medium		Warm	
GP4	time	Χ	у	Х	у	Х	у
	(Min)	269	273	285	293	313	329
1	0-2	280	287	296	307	320	337
2	3-5	279	285	295	305	319	335
3	6-9	277	284	293	304	317	334
4	10-19	276	283	292	303	316	333
5	20-35	274	280	290	300	314	330
6	36-49	272	277	288	297	312	327
7	50-79	271	275	287	295	311	325
8	80-119	270	274	286	294	310	324
9	Over 120	269	273	285	293	309	323

4.3. EYE-Q function check

- (1) Turn on TV.
- (2) Press EYE key of Adjustment remote control.
- (3) Cover the Eye Q II sensor on the front of the using your hand and wait for 6 seconds.
- (4) Confirm that R/G/B value is lower than 10 of the "Raw Data (Sensor data, Back light)". If after 6 seconds, R/G/B value is not lower than 10, replace Eye Q II sensor.
- (5) Remove your hand from the Eye Q II sensor and wait for 6 seconds.
- (6) Confirm that "ok" pop up. If change is not seen, replace Eye Q II sensor.



4.4. Local Dimming Function Check

- Step 1) Turn on TV.
- Step 2) Press "TILT" key on the Adj. R/C.
- Step 3) At the Local Dimming mode, module Edge Backlight moving right to left Back light of IOP module moving.
- Step 4) Confirm the Local Dimming mode.
- Step 5) Press "exit" key.



(Edge LED Model)

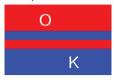
4.5. Magic Motion Remote control test

- (1) Equipment: RF Remote control for test, IR-KEY-Code Remote control for test
- (2) You must confirm the battery power of RF-Remote control before test(recommend that change the battery per every lot)
- (3) Sequence (test)
 - 1) if you select the "Start(Wheel)" key on the Adjustment remote control, you can pairing with the TV SET.
 - 2) You can check the cursor on the TV Screen, when select the "Wheel" key on the Adjustment remote control.
 - 3) You must remove the pairing with the TV Set by select "Mute" key on the Adjustment remote control

4.6. 3D function test

(Pattern Generator MSHG-600, MSPG-6100[Support HDMI1.4])

- * HDMI mode NO. 872, pattern No.83
- (1) Please input 3D test pattern like below.



(2) When 3D OSD appear automatically, then select OK key.



(3) Don't wear a 3D Glasses, check the picture like below.



4.7. Wi-Fi Test

Step 1) Turn on TV

Step 2) Select Network Connection option in Network Menu.



Step 3) Select Start Connection button in Network Connection.



Step 4) If the system finds any AP like blow PIC, it is working well.



4.8. LNB voltage and 22KHz tone check

(only for DVB-S/S2 model)

- Test method
- (1) Set TV in Adj. mode using POWER ON.
- (2) Connect cable between satellite ANT and test JIG.
- (3) Press Yellow key(ETC+SWAP) in Adj Remote control to make LNB on.
- (4) Check LED light 'ON' at 18 V menu.
- (5) Check LED light 'ON' at 22 KHz tone menu.
- (6) Press Blue key(ETC+PIP INPUT) in Adj Remote control to make LNB off.
- (7) Check LED light 'OFF' at 18 V menu.
- (8) Check LED light 'OFF' at 22 KHz tone menu.
- Test result
- (1) After press LNB On key, '18 V LED' and '22 KHz tone LED' should be ON.
- (2) After press LNB OFF key, '18 V LED' and '22 KHz tone LED' should be OFF.

4.9. Option selection per country

4.9.1. Overview

- Option selection is only done for models in Non-EU

4.9.2. Method

- (1) Press ADJ key on the Adj. R/C, then select Country Group Meun
- (2) Depending on destination, select Country Group Code 04 or Country Group EU then on the lower Country option, select US, CA, MX. Selection is done using +, - or ▶ ◀ key.

4.10. Tool Option selection

 Method: Press "ADJ" key on the Adjustment remote control, then select Tool option.

4.11. Ship-out mode check(In-stop)

 After final inspection, press "IN-STOP" key of the Adjustment remote control and check that the unit goes to Stand-by mode.

4.12. GND and Internal Pressure check

4.12.1. Method

- (1) GND & Internal Pressure auto-check preparation
 - Check that Power cord is fully inserted to the SET. (If loose, re-insert)
- (2) Perform GND & Internal Pressure auto-check
 - Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
 - Connect D-terminal to AV JACK TESTER
 - Auto CONTROLLER(GWS103-4) ON
 - Perform GND TEST
 - If NG. Buzzer will sound to inform the operator.
 - If OK, changeover to I/P check automatically. (Remove CORD, A/V form AV JACK BOX.)
 - Perform I/P test
 - If NG, Buzzer will sound to inform the operator.
 - If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

4.12.2. Checkpoint

- TEST voltage
- GND: 1.5 KV / min at 100 mA
- SIGNAL: 3 KV / min at 100 mA
- TEST time: 1 second
- TEST POINT
- GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
- Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL
- LEAKAGE CURRENT: At 0.5 mArms

5. Audio

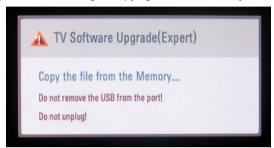
No	0.	Item	Min	Тур	Max	Unit	Remark
		Audio practical	9	10	12	W	EQ Off
1	1. max Output, L/R (Distortion=10% max Output)		8.10	10.8	Vrms	AVL Off Clear Voice Off	
2		Speaker (8Ω Impedance)	9	10	12	W	EQ Off AVL Off Clear Voice Off

Measurement condition:

- (1) RF input: Mono, 1 KHz sine wave signal, 100 % Modulation
- (2) CVBS, Component: 1 KHz sine wave signal 0.5 Vrms
- (3) RGB PC: 1 KHz sine wave signal 0.7 Vrms

6. USB S/W Download(Service only)

- (1) Put the USB Stick to the USB socket.
- (2) Automatically detecting update file in USB Stick.
 - If your downloaded program version in USB Stick is Low, it didn't work. But your downloaded version is High, USB data is automatically detecting.
 - (Download Version High & Power only mode, Set is automatically Download)
- (3) Show the message "Copying files from memory".



(4) Updating is starting.

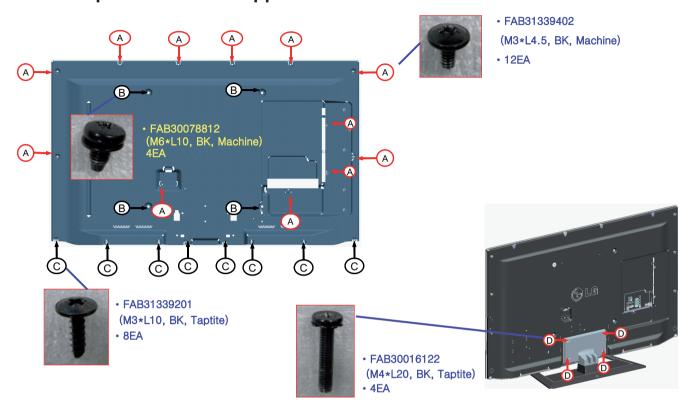




- (5) Updating Completed, The TV will restart automatically.
- (6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
- * If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ATV test on production line.
- * After downloading, have to adjust Tool Option again.
 - (1) Push "IN-START" key in service remote control.
 - (2) Select "Tool Option 1" and push "OK" key.
 - (3) Punch in the number. (Each model has their number)

SCREW ASSEMBLY WORKING GUIDE

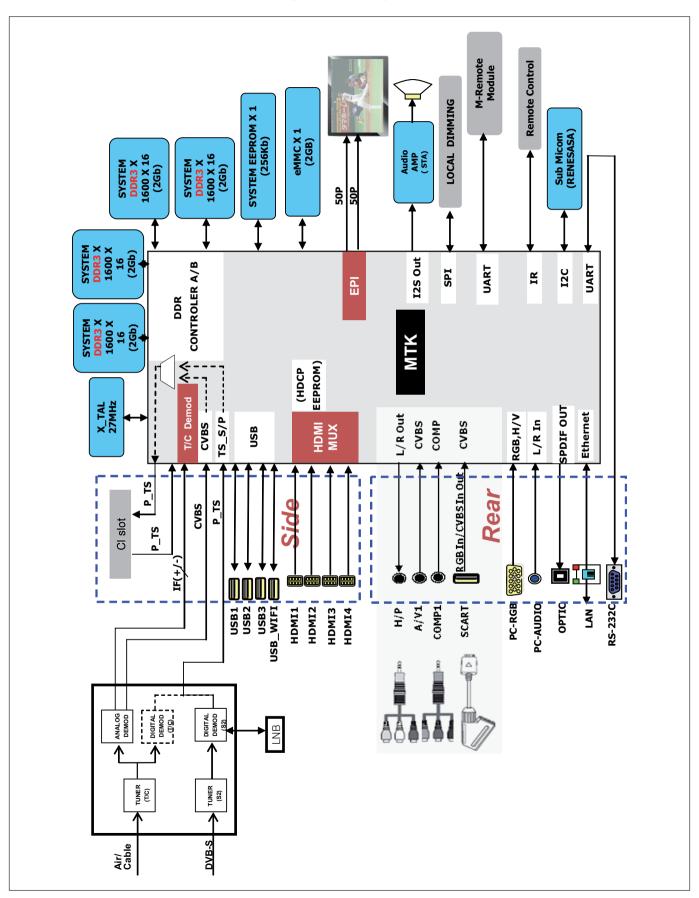
■ Screw specification and application situation



<Warning>

Check Screw Type When Screw is assembled at 'A' Part. If 'C' Screw is used at the 'A' part, Module will get damaged.

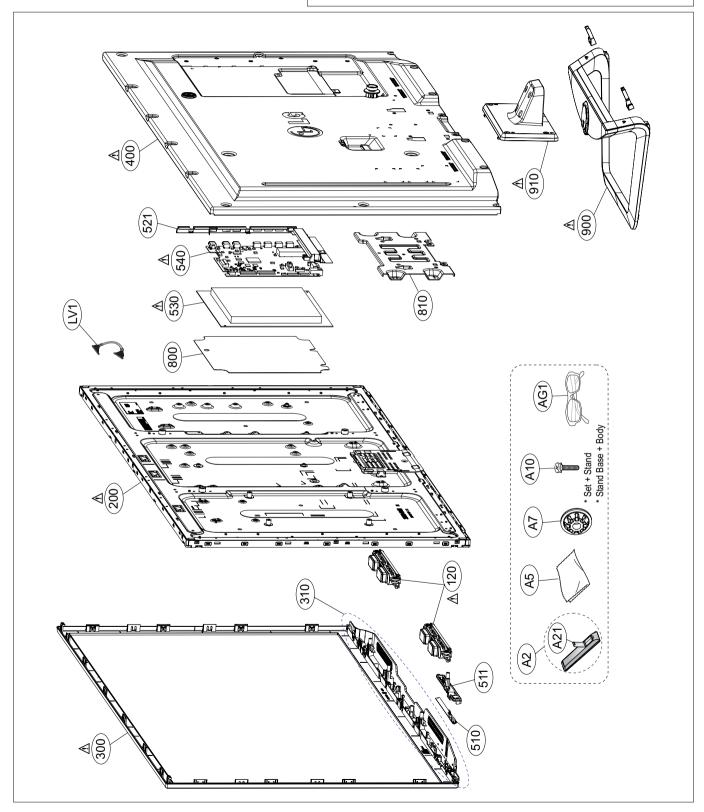
BLOCK DIAGRAM

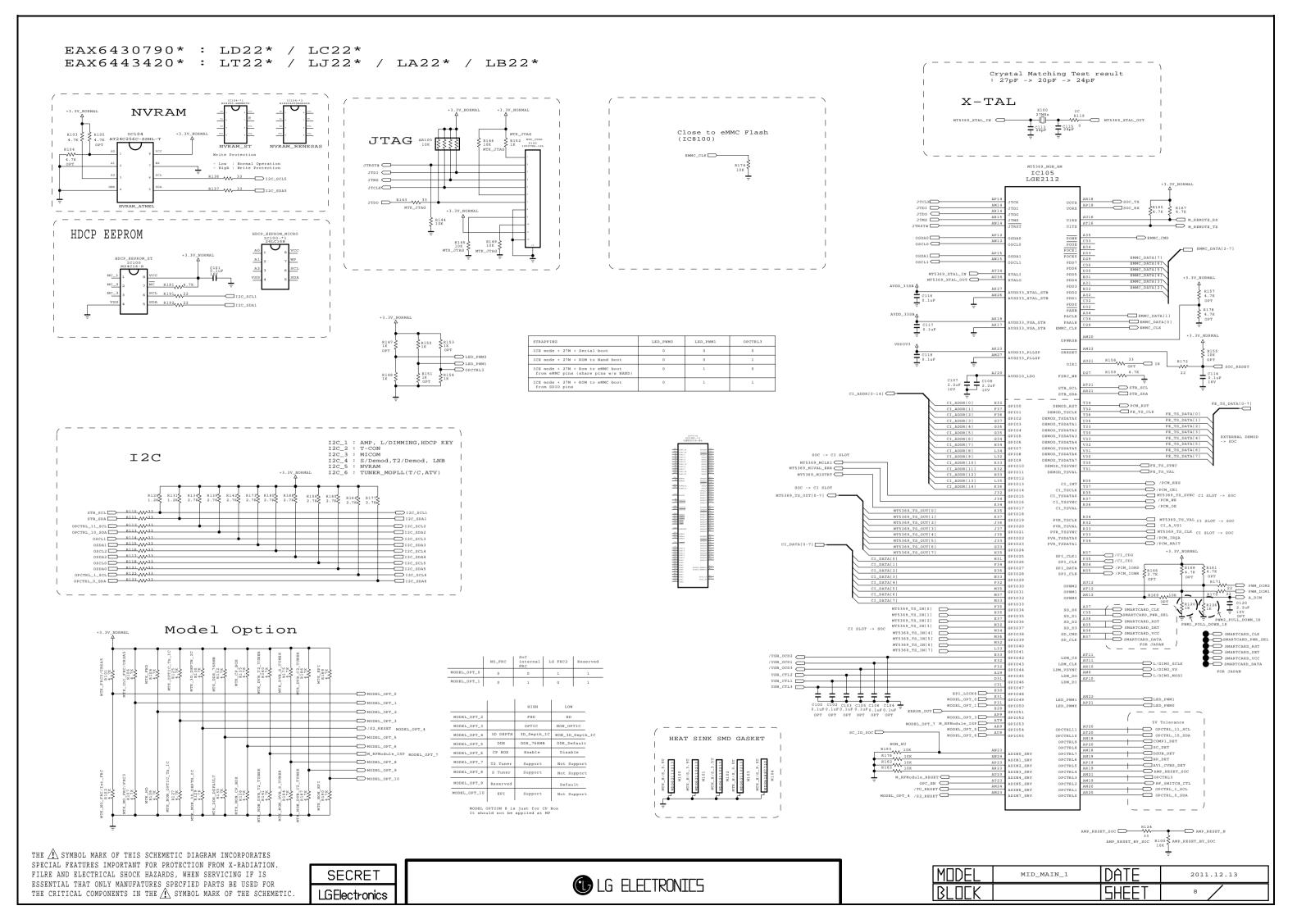


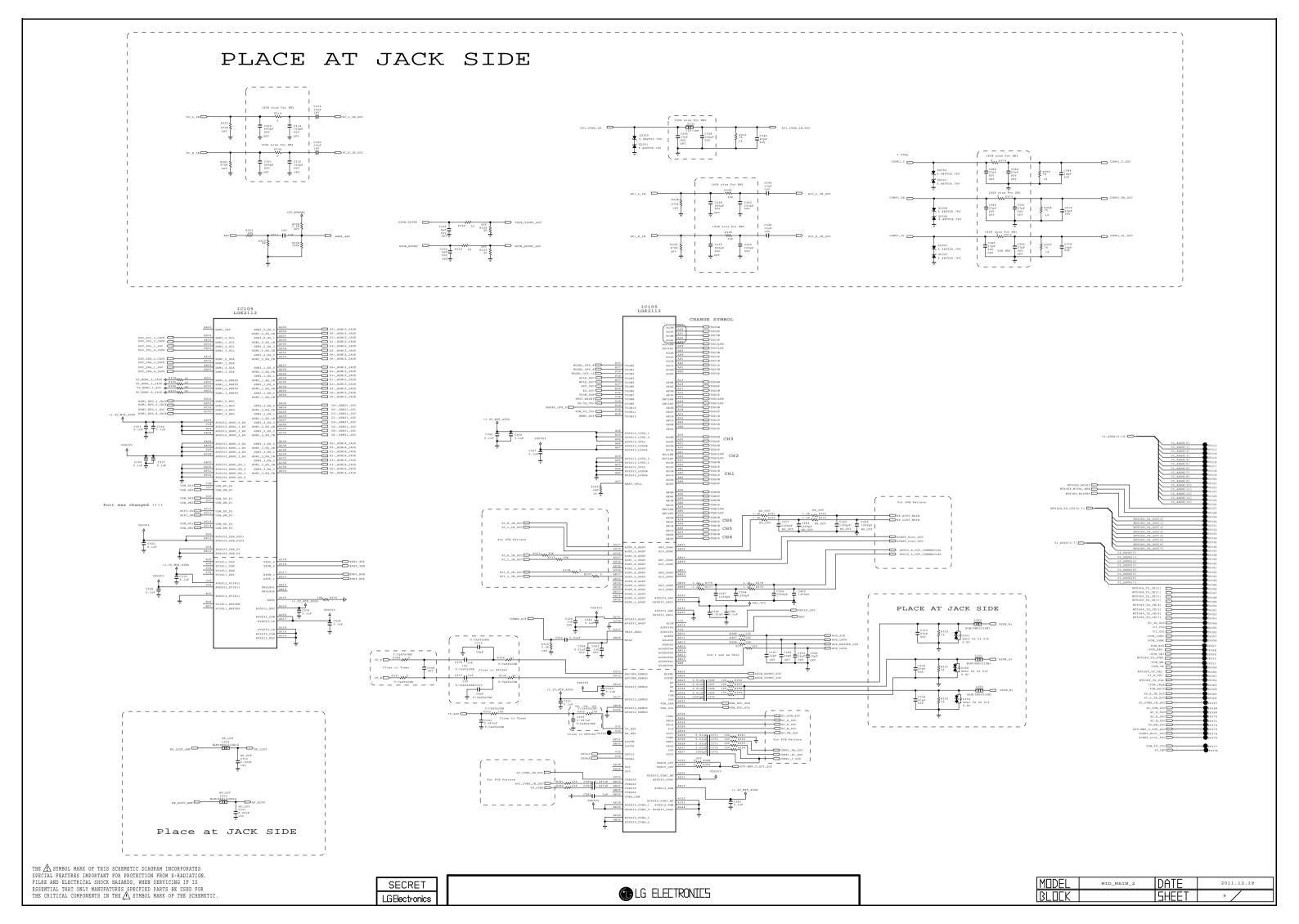
EXPLODED VIEW

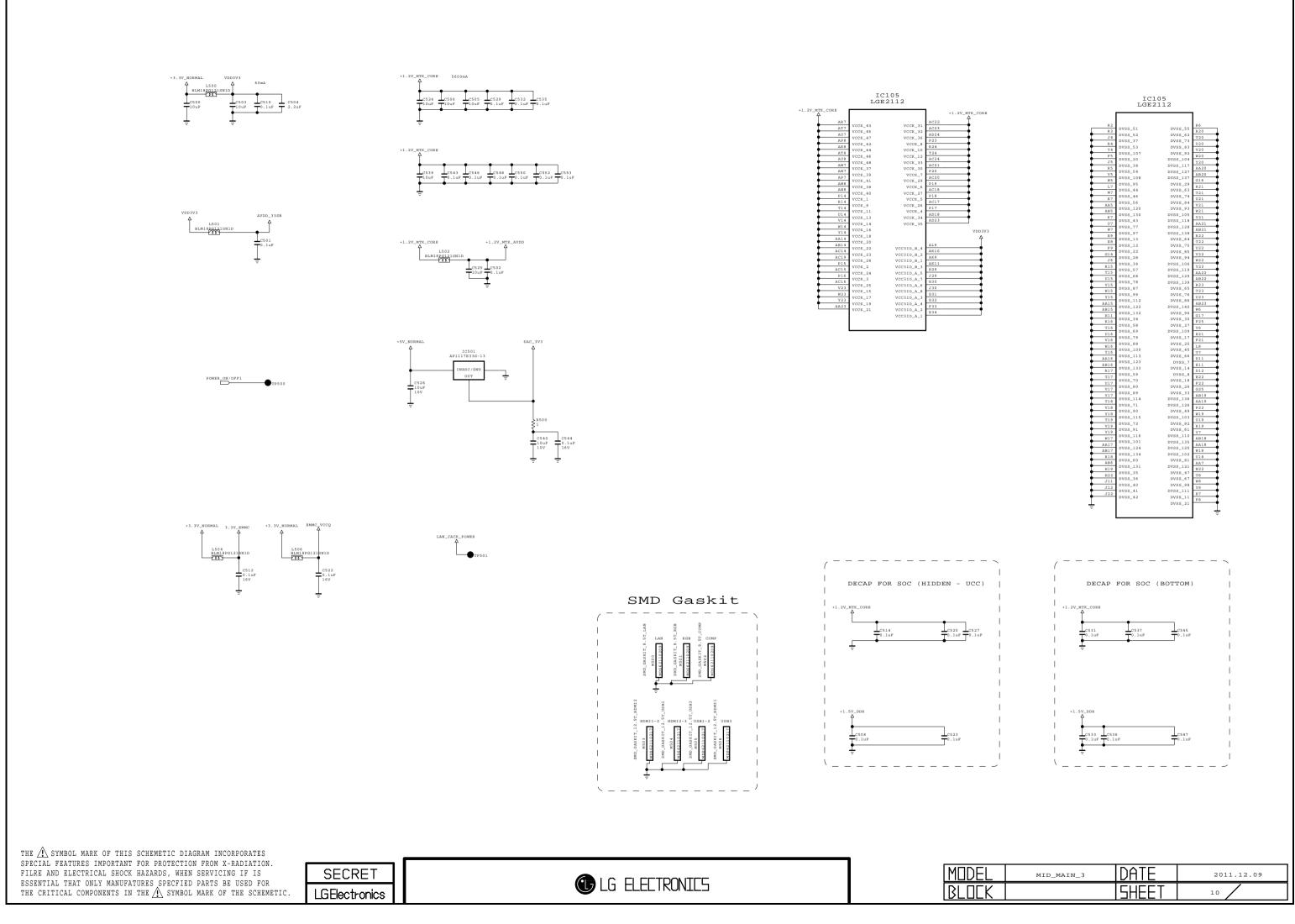
IMPORTANT SAFETY NOTICE

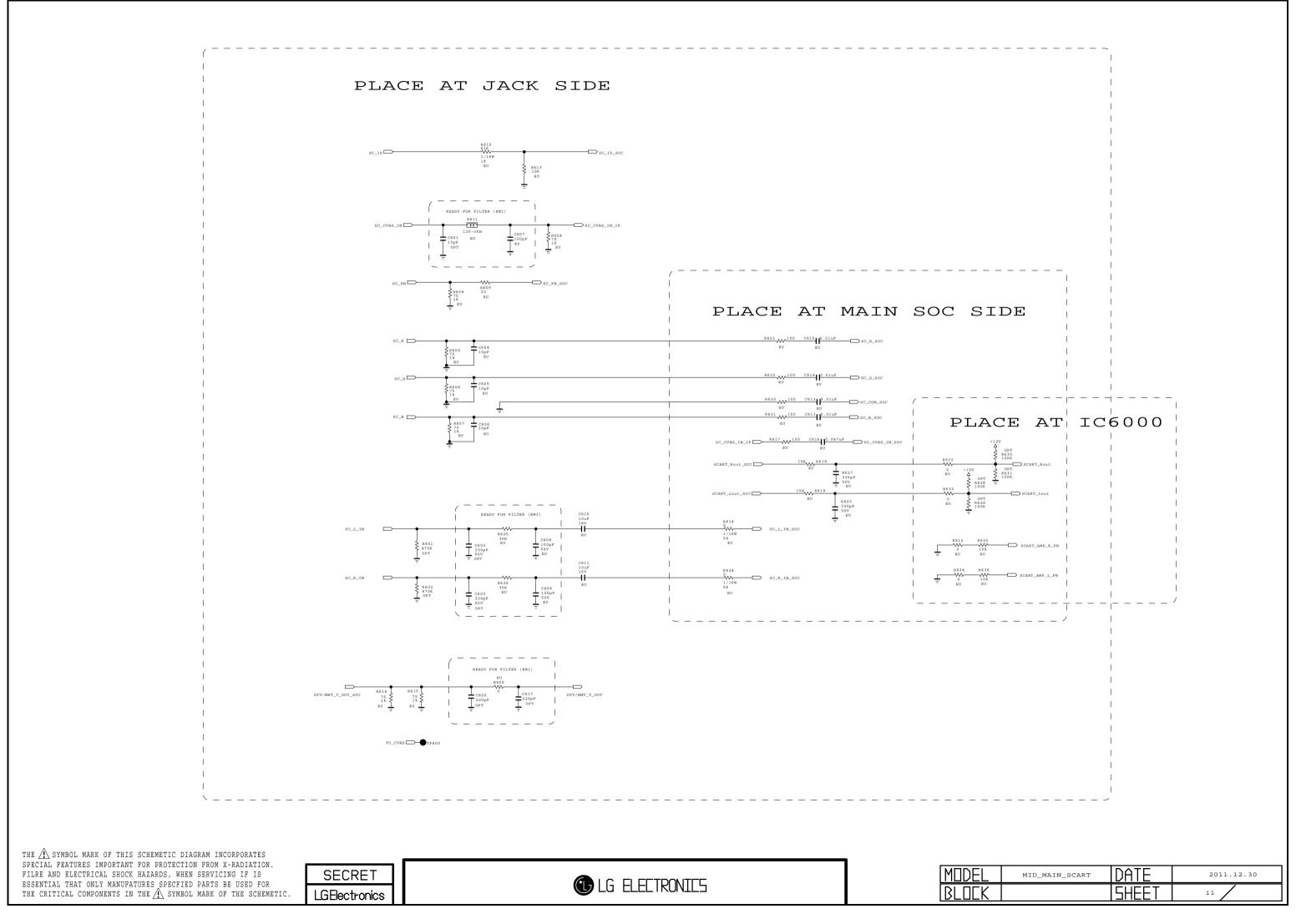
Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by \triangle in the Schematic Diagram and EXPLODED VIEW. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.

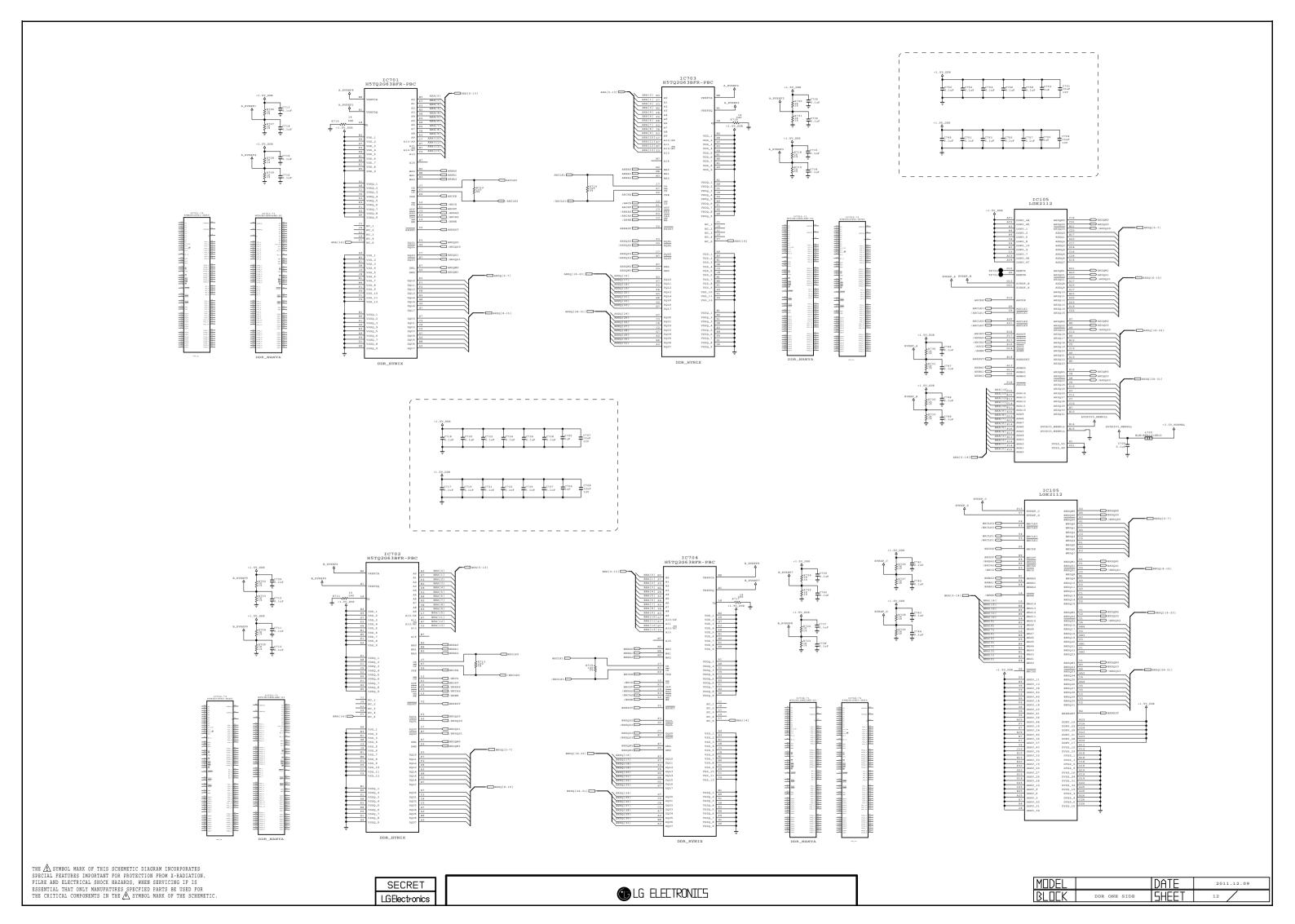


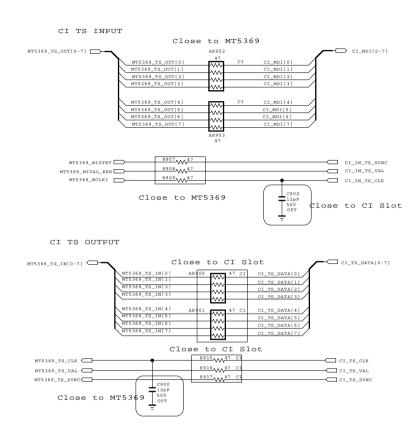


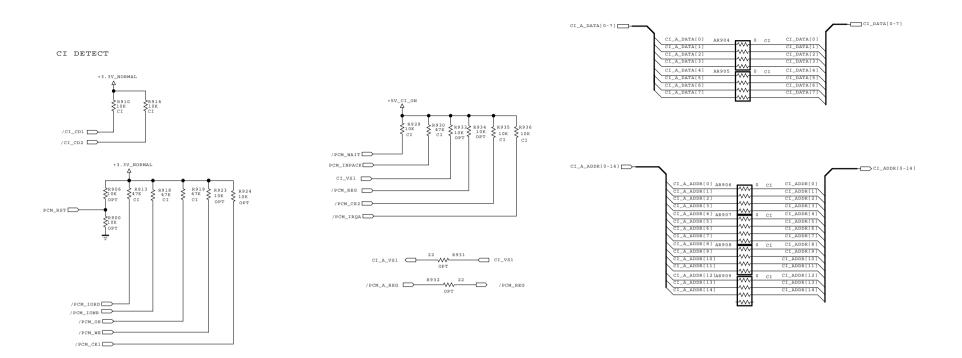


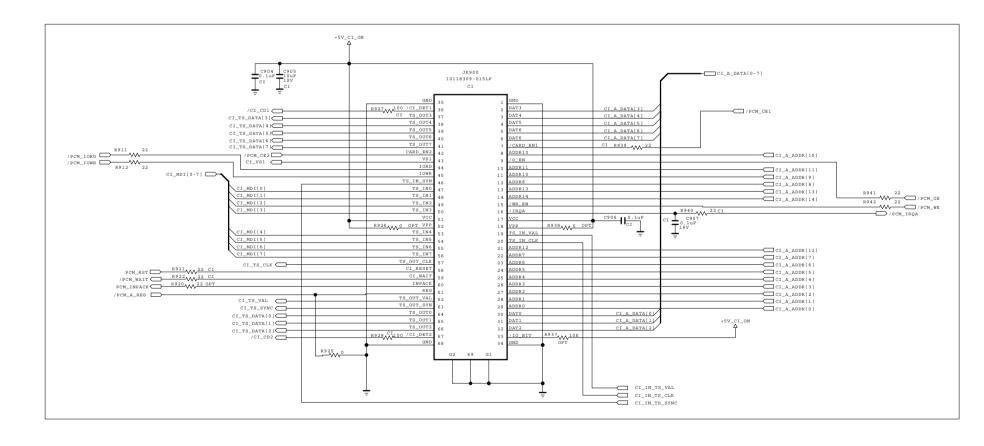












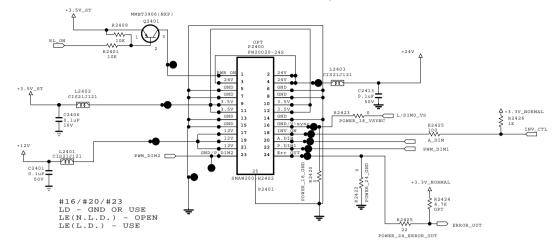
THE A SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE A SYMBOL MARK OF THE SCHEMETIC.

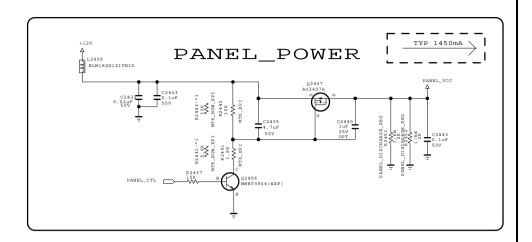
SECRET LGElectronics

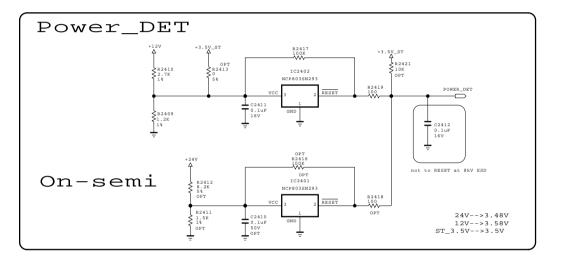
LG ELECTRONICS

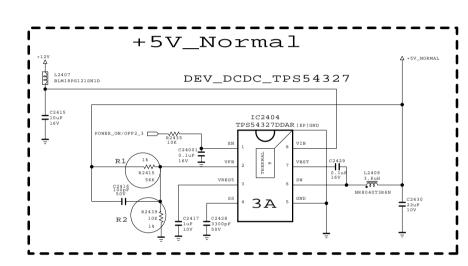
MODEL MID_MAIN_CI DATE 2011.11.21
BLOCK SHEET 13

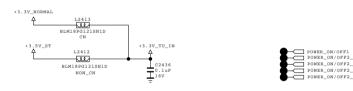


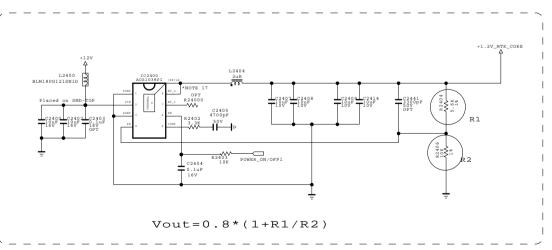


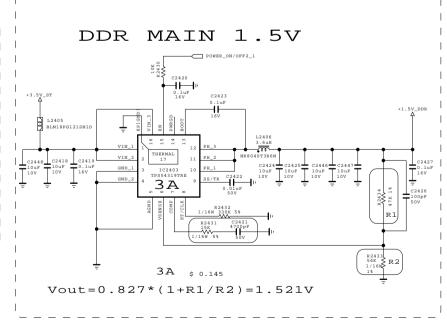


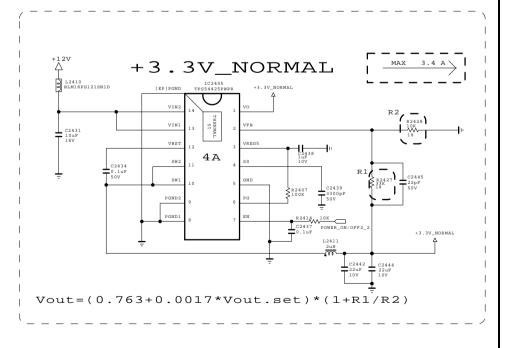












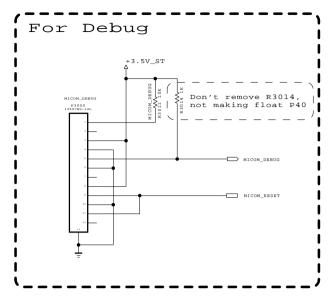
THE \(\hat{\Lambda}\) SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE \(\hat{\Lambda}\) SYMBOL MARK OF THE SCHEMETIC.

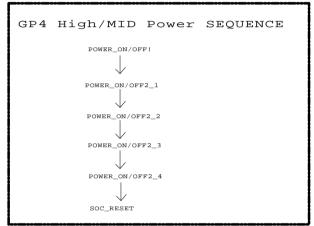
SECRET LGElectronics

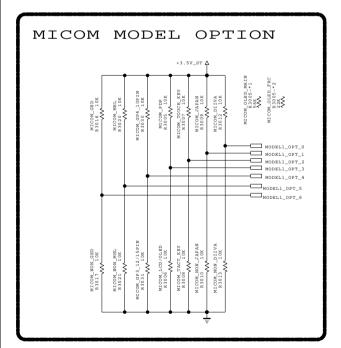
LG ELECTRONICS

MODEL MID_POWER DATE 2011.11.25
BLOCK SHEET 24

Renesas MICOM







MICOM MODEL OPTION

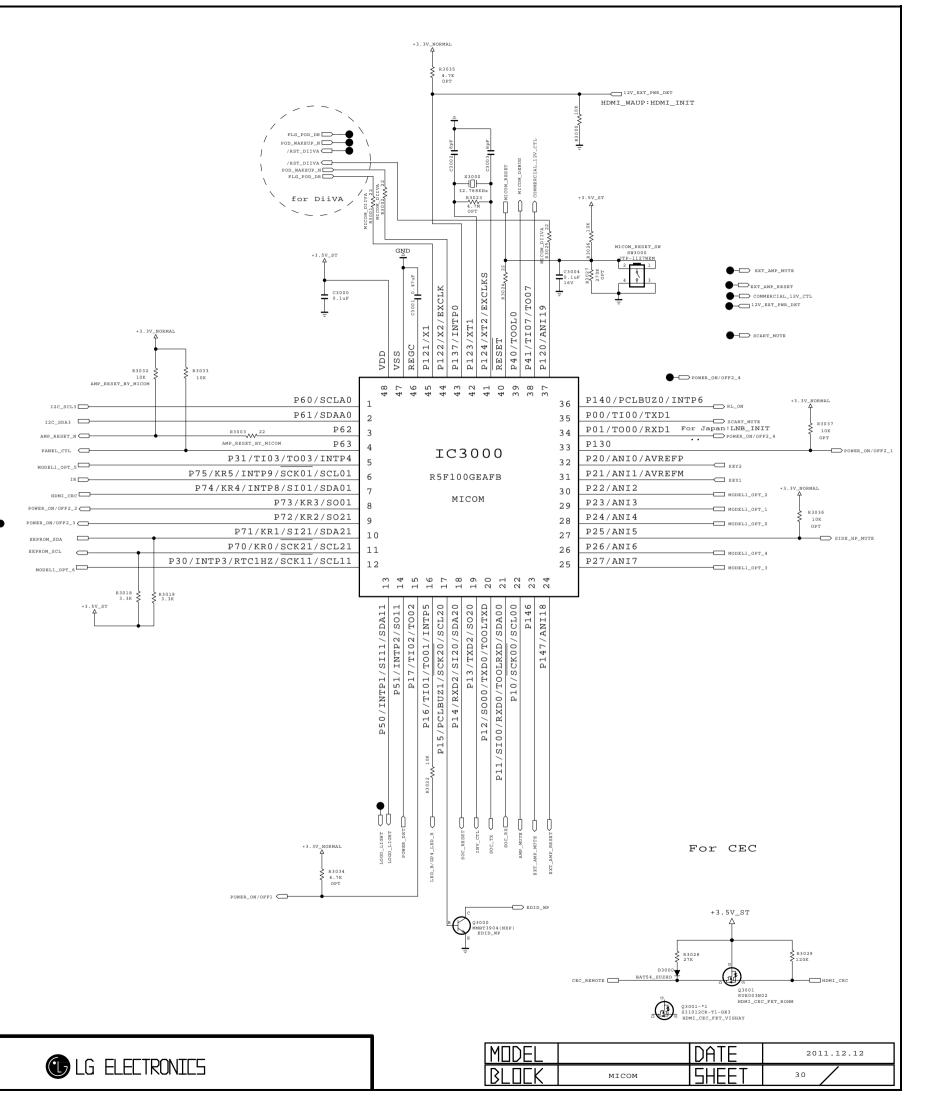
	0	1	
MODEL_OPT_0	NON DIVA	DIVA	For China
MODEL_OPT_1	NON JAPAN	JAPAN	For JAPAN
MODEL_OPT_2	TACT_KEY	TOUCH_KEY	
MODEL_OPT_3	LCD / OLED	PDP	
MODEL_OPT_4	IR Wafer 12/15Pin (GP3_Soft touch)	IR Wafer 10Pin (GP4_TOOL)	For Sample Set
MODEL_OPT_5	NON_MHL	MHL	GP4_HIGH
MODEL_OPT_6	NON_GED	GED	

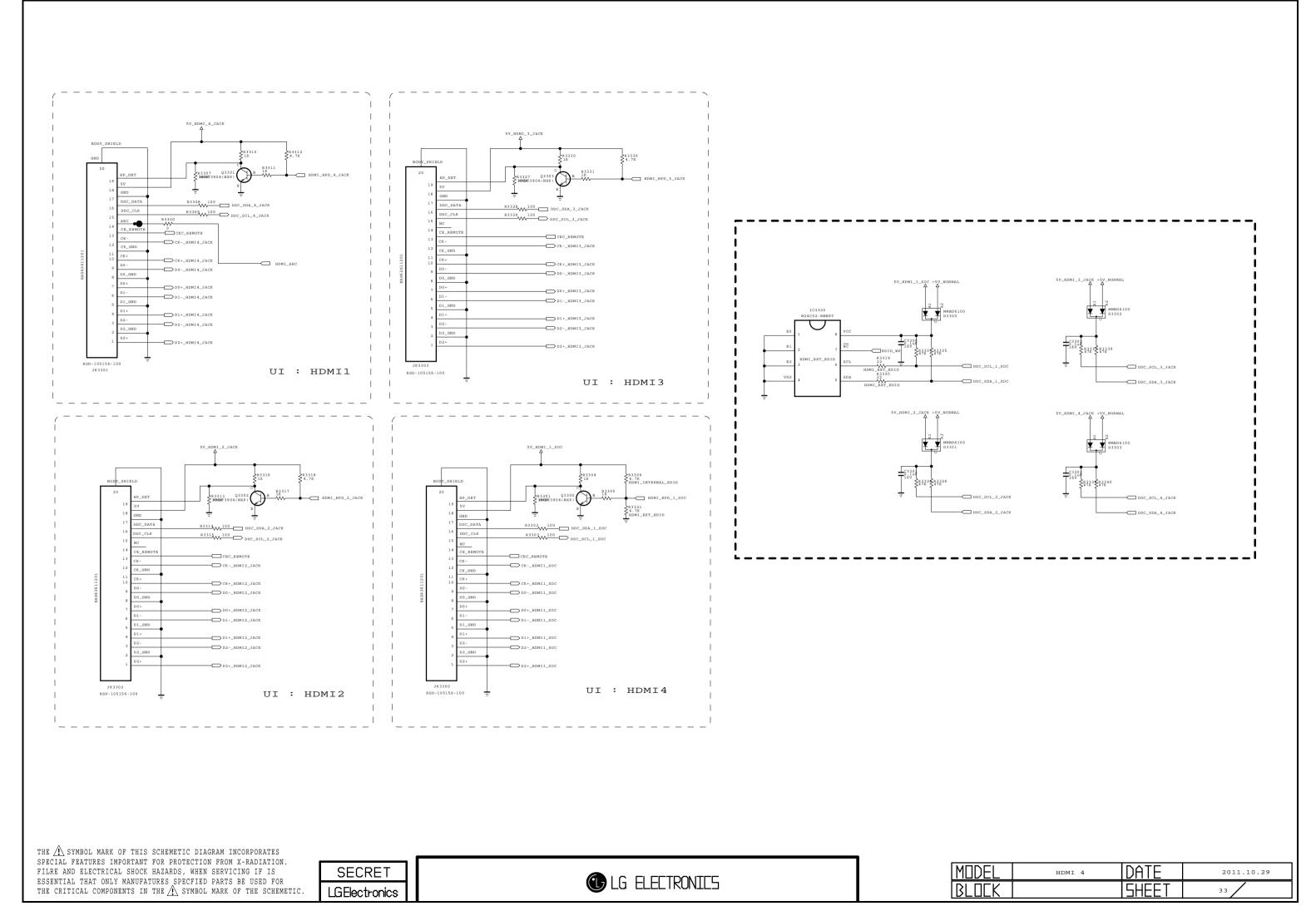
Eye Sensor Option

MODEL_OPT_4	0	1	
0	N/A	MC8101_ABOV (TACT_KEY)	
1	CM3231_CAPELLA (GP3 Soft touch)	CM3231_CAPELLA (GP4 Soft touch)	

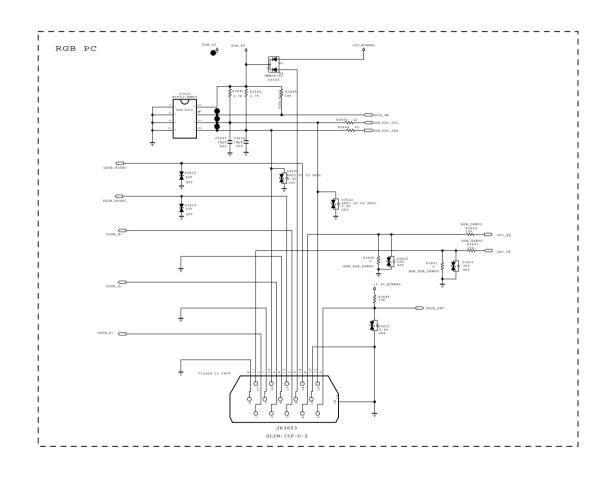
THE \(\hat{\Lambda}\) SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE \(\hat{\Lambda}\) SYMBOL MARK OF THE SCHEMETIC.

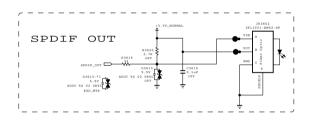


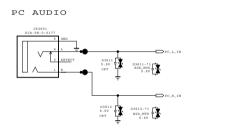




RGB/ PC AUDIO/ SPDIF





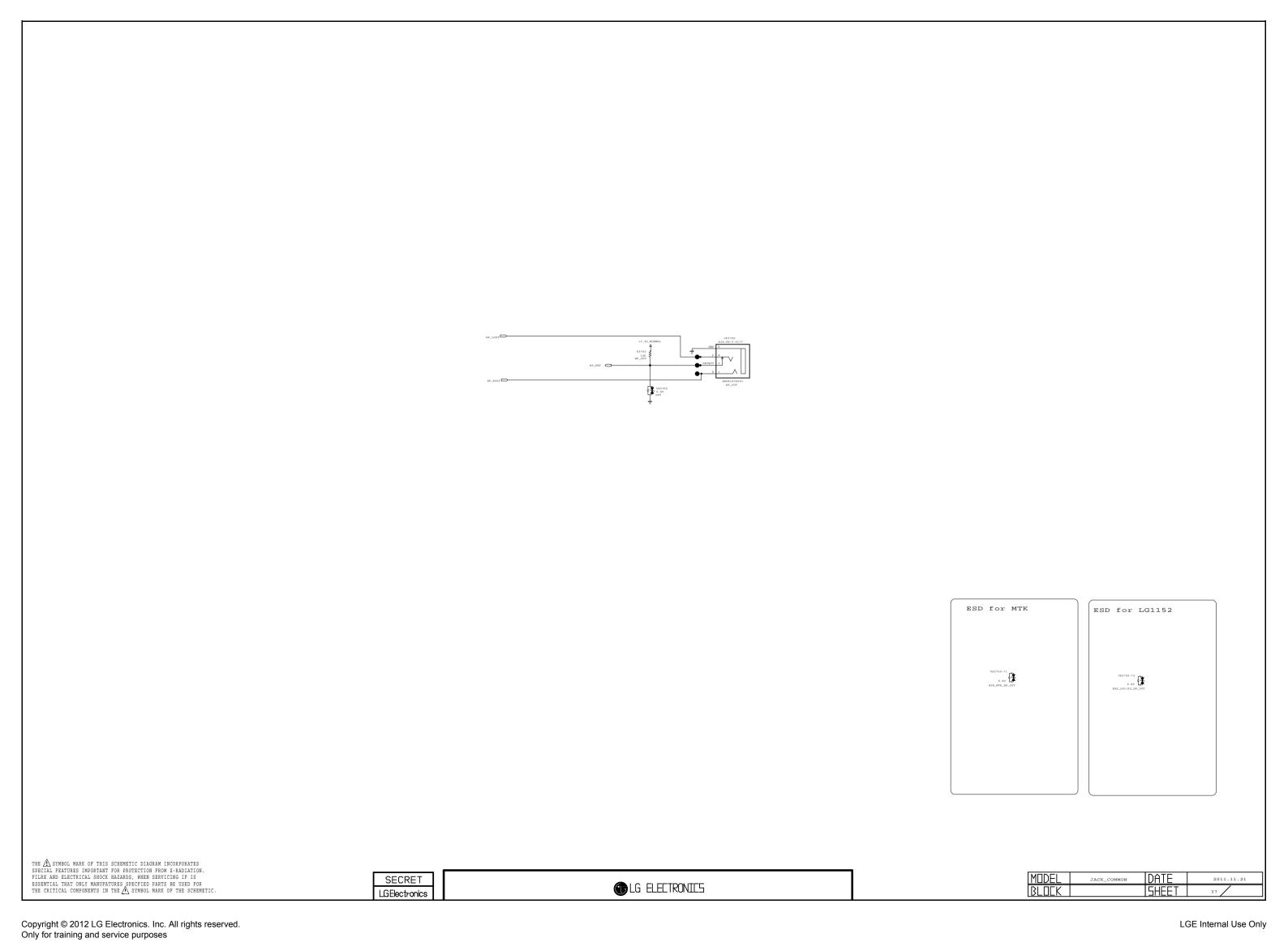


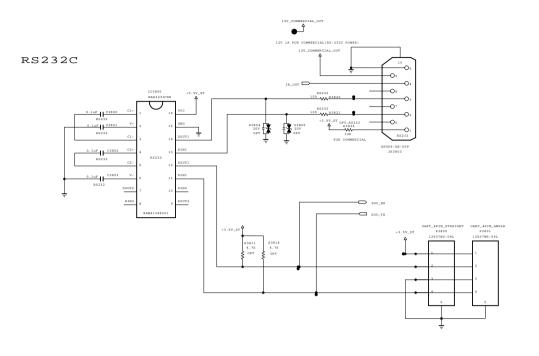
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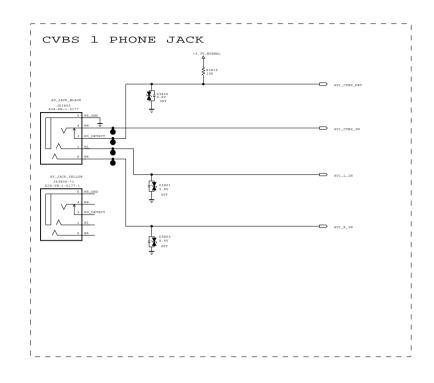
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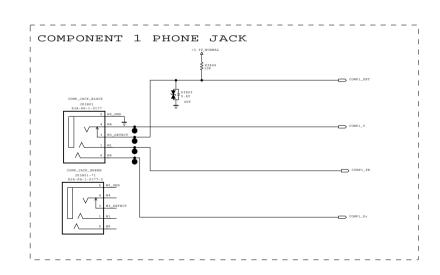
GLG ELECTRONICS

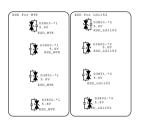
MODEL JACK HIGH / MID DATE 2011.11.21
BLOCK SHEET 36











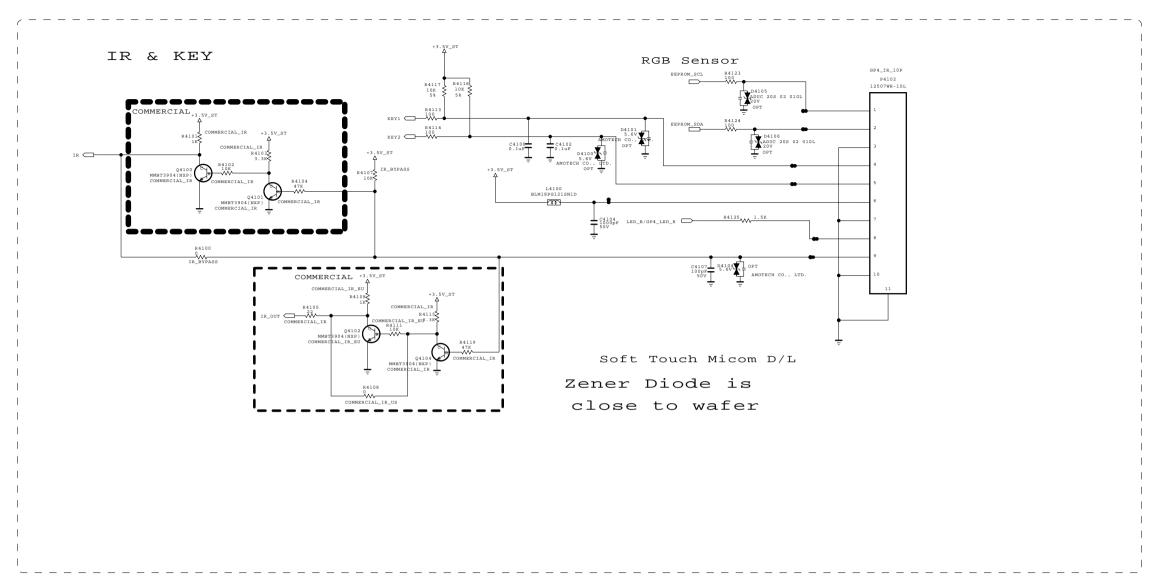
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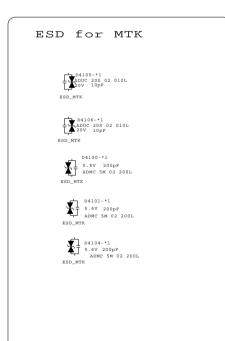
SECRET LGElectronics

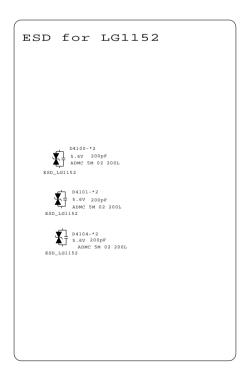
LG ELECTRONICS

 MODEL
 JACK_COMMON
 DATE
 2011.11.21

 BLOCK
 SHEET
 38





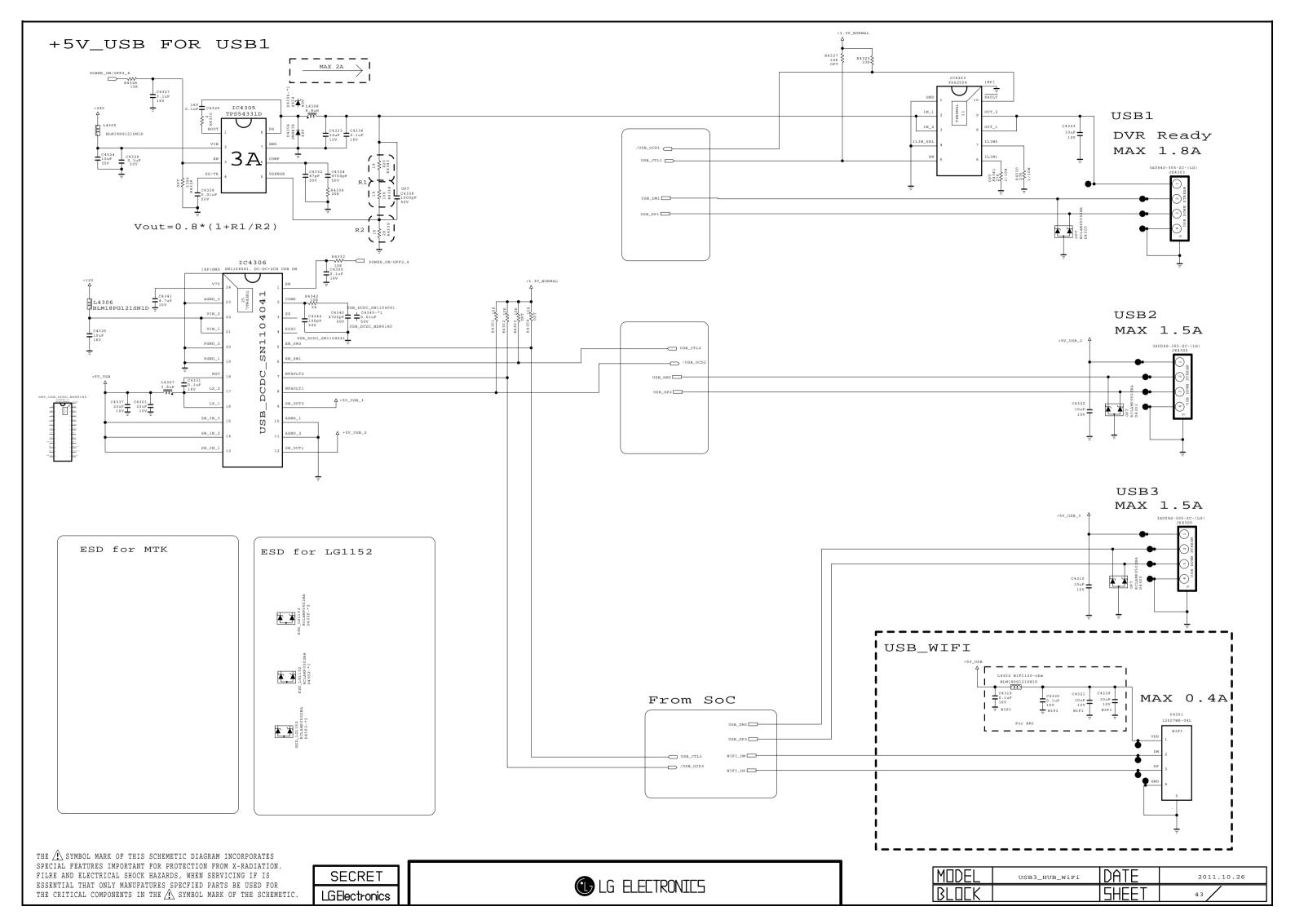


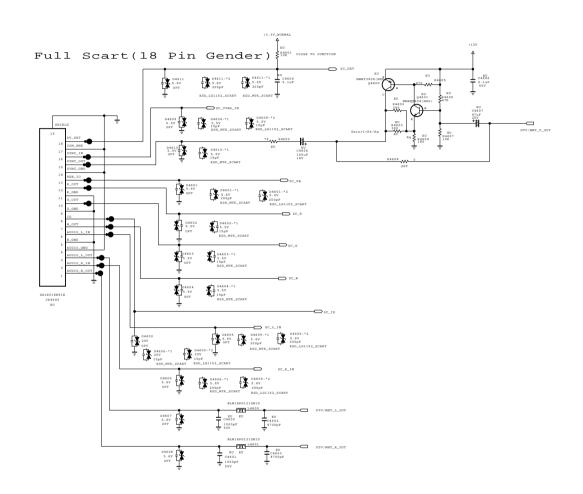
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SECRET LGElectronics

G LG ELECTRONICS

MODEL IR / KEY DATE 2011.11.21
BLOCK SHEET 41



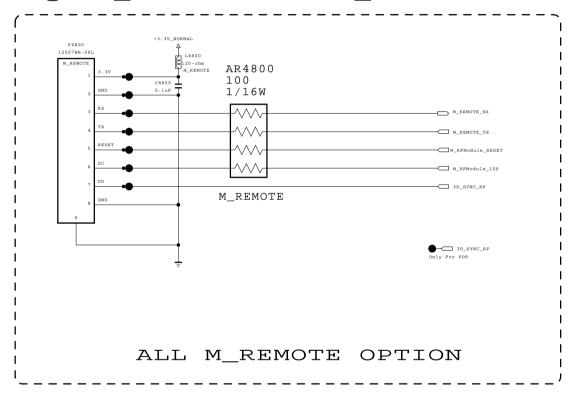


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SECRET LGElectronics

GLG ELECTRONICS

ZigBee_Radio Pulse M_REMOTE OPTION



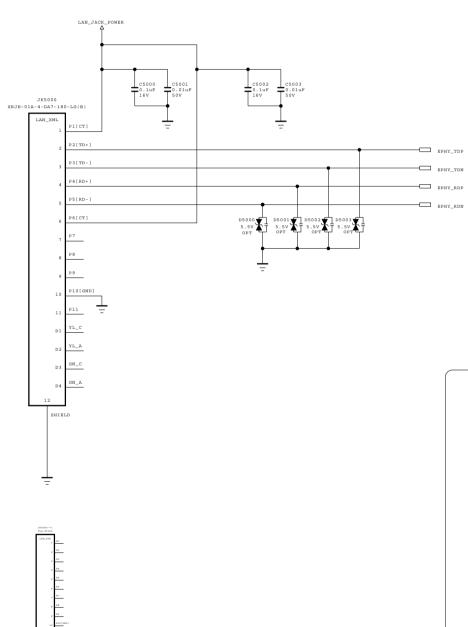
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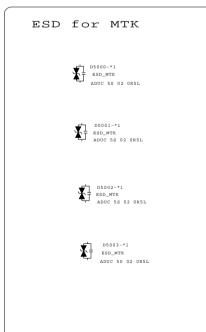
SECRET LGElectronics

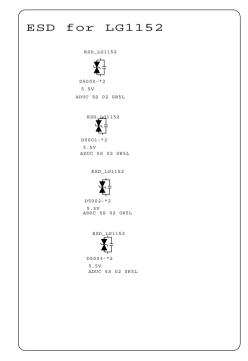
LG ELECTRONICS

MODEL	MOTION REMOTE	DATE	2011.11.21
BLOCK		SHEET	48

Ethernet Block





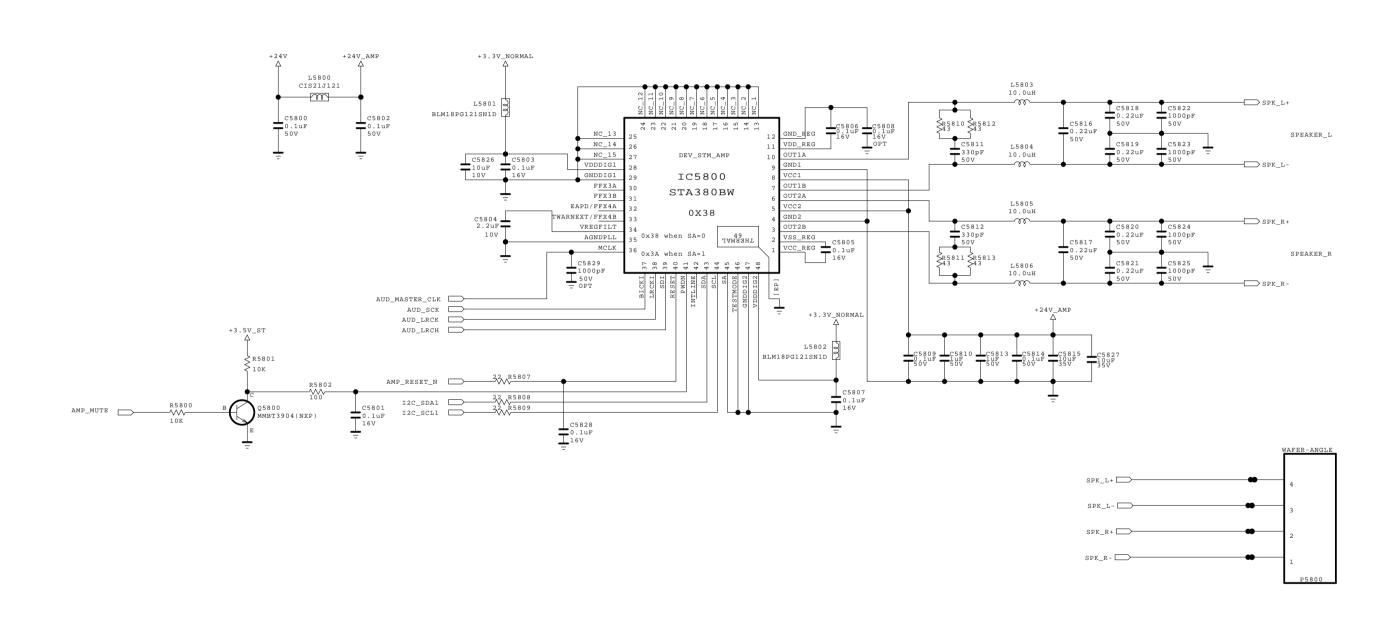


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SECRET LGElectronics

LG ELECTRONICS

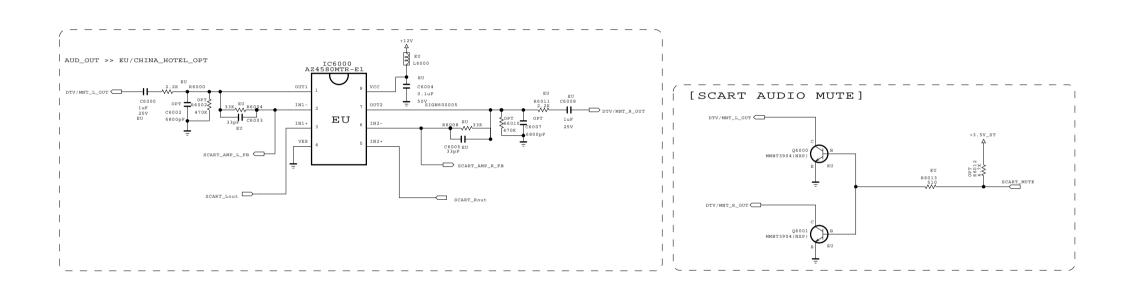
MODEL LAN_VERTICAL DATE 2011.12.09
BLOCK SHEET 50



THE PSYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION.
FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE PSYMBOL MARK OF THE SCHEMETIC



MODEL	GP4_MT5369	DATE	2011.11.21
BLOCK	AUDIO[ST]	SHEET	58

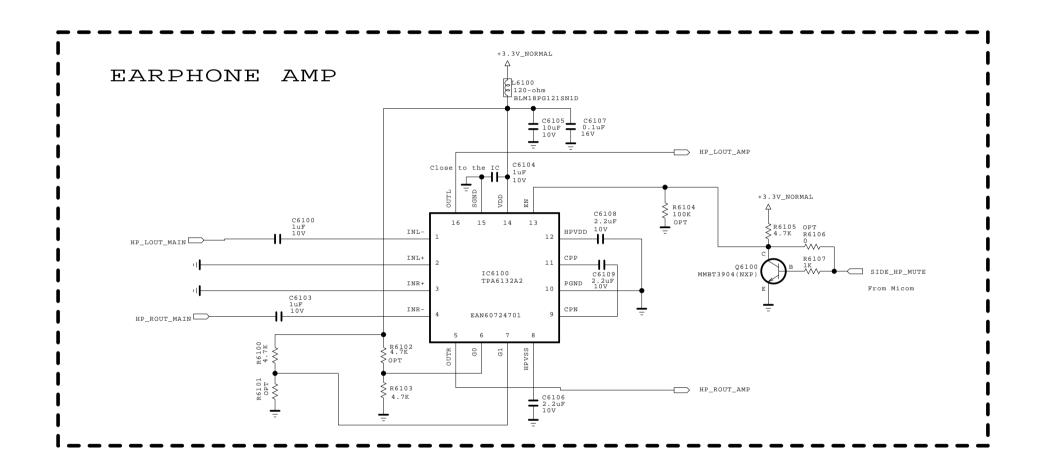


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SECRET LGElectronics

LG ELECTRONICS

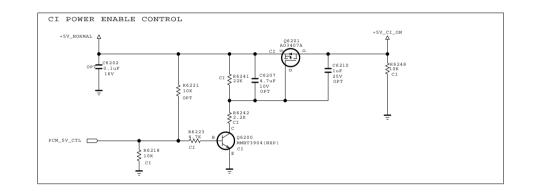
MODEL SCART AUDIO AMP DATE 2011.11.21
BLOCK SHEET 60



THE SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMETIC



MODEL	HEADPHONE AMP	DATE	2011.09.29
BLOCK		SHEET	61



Option FOR MTK

1uF 25V CI_MTK Option FOR LG1152

THE \bigwedge SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE \bigwedge SYMBOL MARK OF THE SCHEMETIC.

SECRET LGElectronics



 MODEL
 CI SLOT
 DATE
 2011.10.31

 BLOCK
 SHEET
 62

T/C/S & H/NIM & T2/C TUNER(EU & CHINA) RF_SWITCH_CTL USE: T2/C,T/C,ATSC,DTMB.ISDB-T ERROR & VALID PIN TU6501 TU6502 TU6500 TU6504 TDSH-T151F TU6503 TDSS-G151D TDSN-G351D TDSQ-H051F TDSQ-G051D close to TUNER BLD TU_TS_ERR TW_H/NIM T/C_H/NIM_V T2/C_F/NIM_DEV CHB_V T/C/S2 V -5V[SPLITTER] RESET RESET RESET SCL SCL SDA SDA +B1[3.3V] +B1[3.3V] 3.3V TUNER SIF SIF +B2[1.8V] +B2[1.8V] CVBS CVBS IF AGC IF AGC r/C_IF_AGC NOT T/C& DIF[P] DIF[P] C/C DIF[P] DIF[N] OT T/C&AT&C +B3[3.3V] NOT_DVB_S +B4[1.23V] 13 SHIELD SHIELD NC_5 S CVBS ERROR SD_ERROR ERROR L9_T2/C/S SYNC VALTD /ALID MCLK FE_TS_DATA[0 22 23 NOT_T/C&AT +3.3V TU IN SHIELD GND_3 SD 1.23V DEMONDA 1.23V S2 DEMQE -m-SD RESET 2_RESET 2A SD_3.3V_DEMOD32 N.C_8 32_F22_OUTPUT3 SD_SCL S2_SCI SD SDA S2_SDA — I2C_SCL4 Vout = 0.6*(1+R1/R2)LNB 36 CHB : Max 480mA else : Max 240mA GND_4 38 — I2C_SDA4 SHIELD +3.3V_TU +1.8V_TU SHIELD Close to the tuner

LG ELECTRONICS

THE A SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION.

FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS

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SECRET

LGElectronics

2011.11.21

DATE

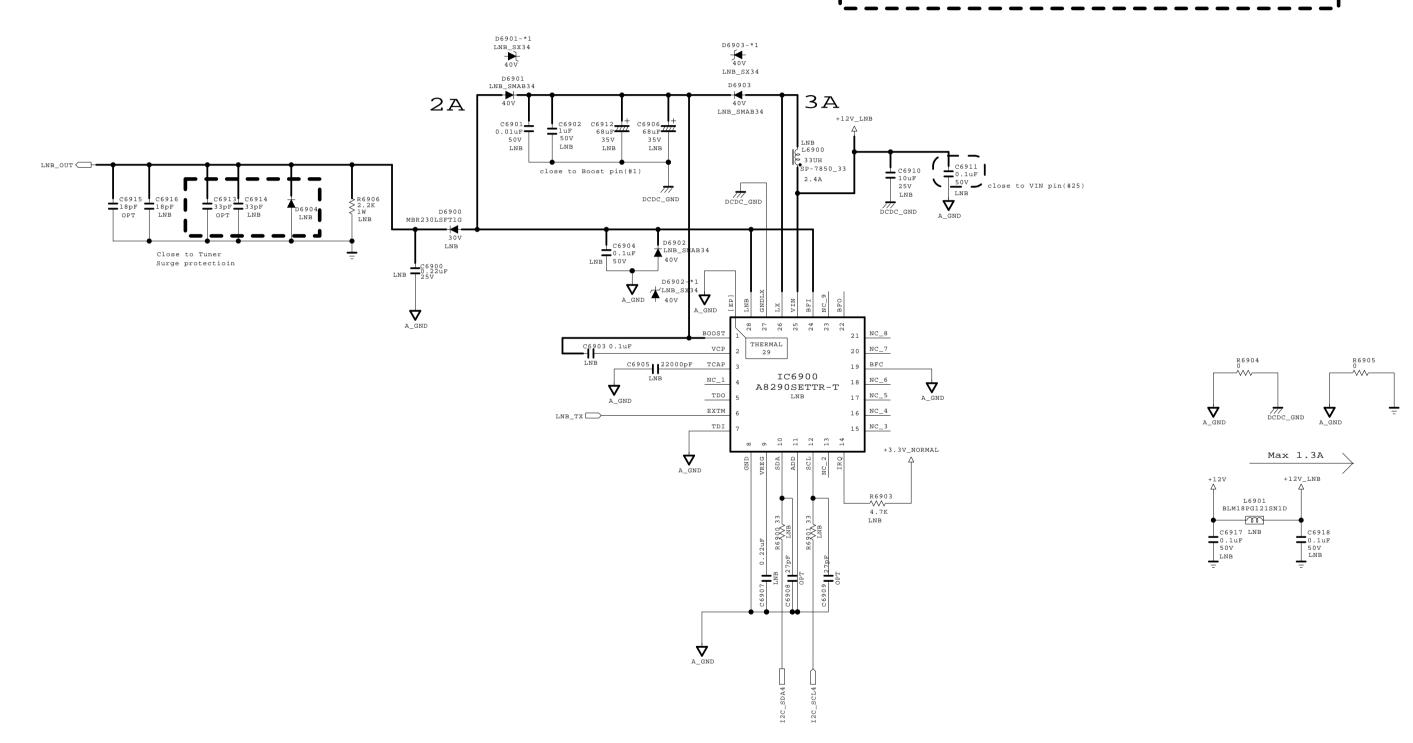
SHEE

DVB-S2 LNB Part Allegro

(Option:LNB)

DCDC_GND and A_GND are connected
DCDC_GND and A_GND are connected in pin#27
PCB_GND and A_GND are connected

Input trace widths should be sized to conduct at least 3A Ouput trace widths should be sized to conduct at least 2A

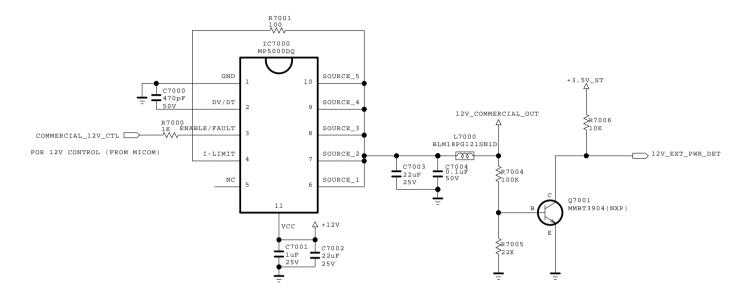


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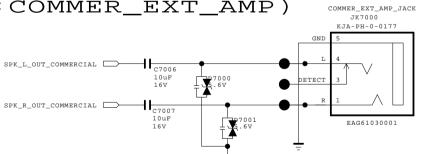


MODEL	LNB	DATE	2011.11.21
BLOCK		SHEET	69

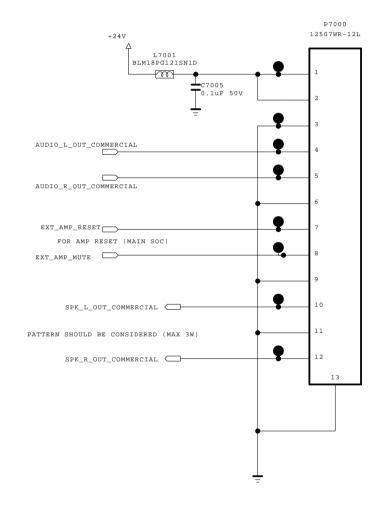
FOR COMMERCIAL 12V OUT RS-232C 9 PIN (OPT:COMMER_EXT_12V)



AUDIO OUT JACK (OPT:COMMER_EXT_AMP)



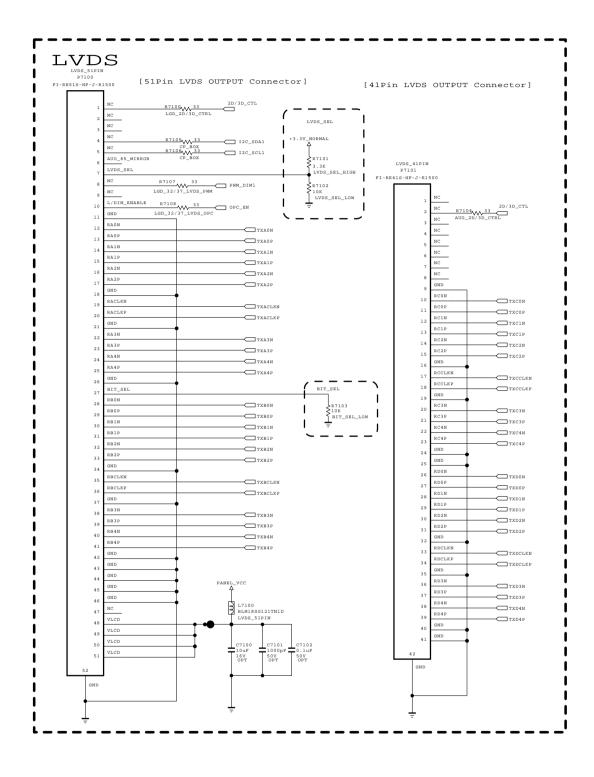
FOR COMMERCIAL AUDIO OUT (OPT:COMMER_EXT_AMP)



THE /!\ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE /!\ SYMBOL MARK OF THE SCHEMETIC



MODEL	COMMERCIAL_OPTION	DATE	2011.11.21
BLOCK		SHEET	70

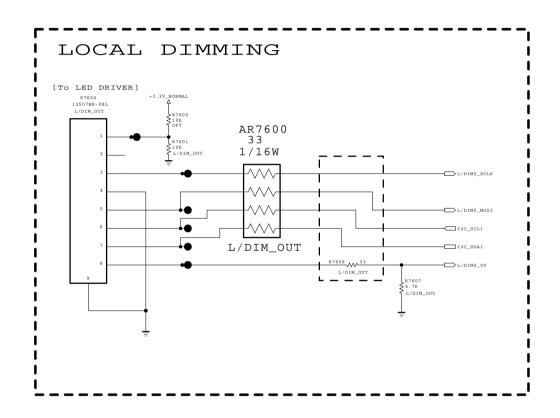


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SECRET LGElectronics

LG ELECTRONICS

MODEL	LVDS_HIGH_MID	DATE	2011.08.11
BLOCK		SHEET	71

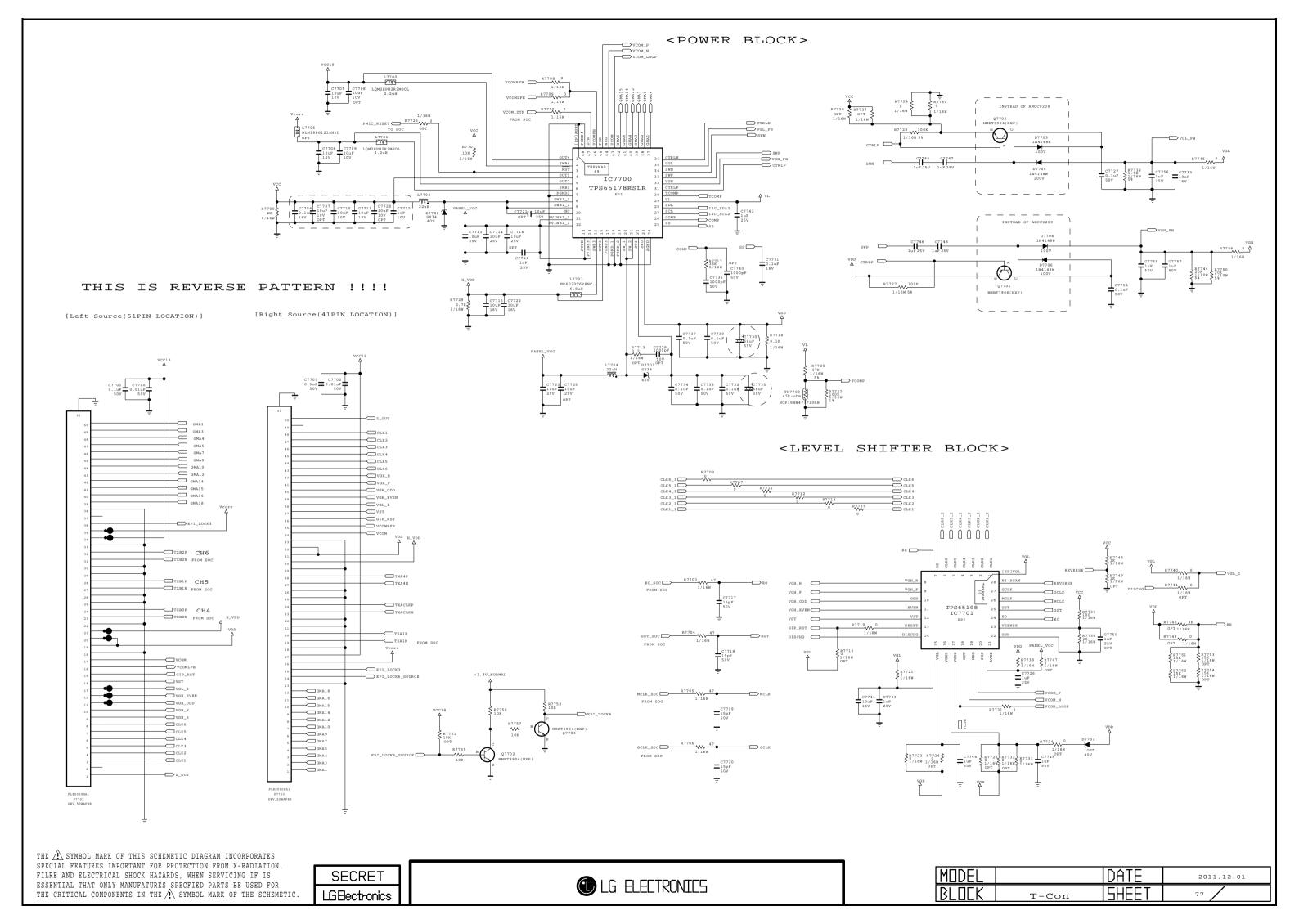


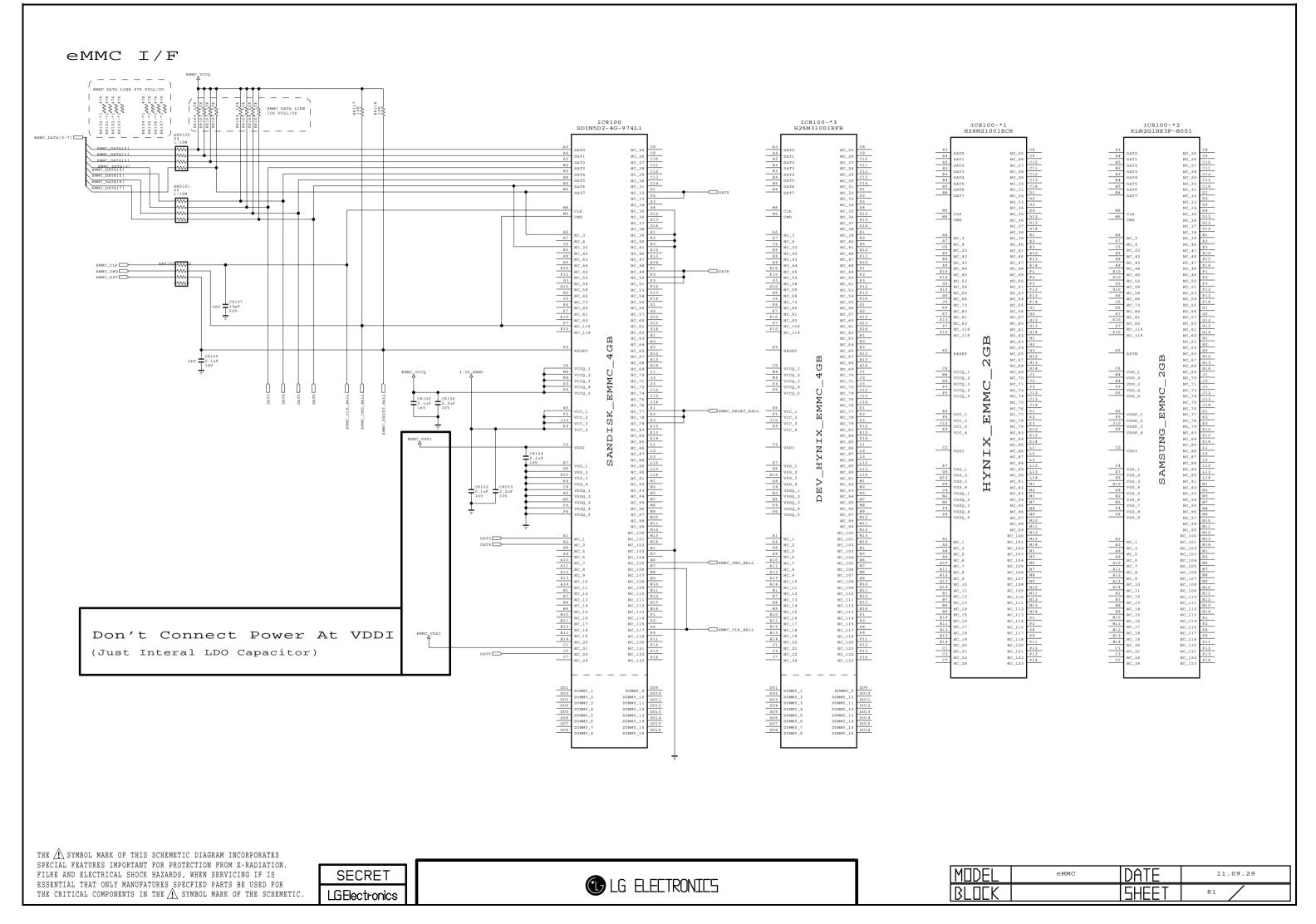
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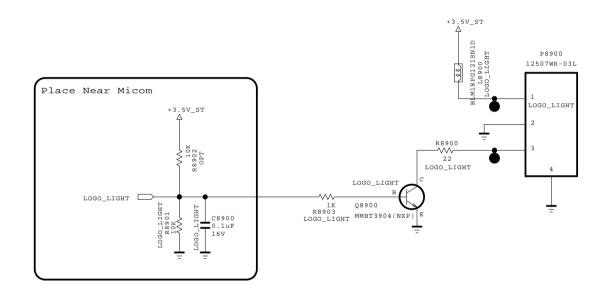
SECRET LGElectronics

LG ELECTRONICS

MODEL	LOCAL DIMMING	DATE	2011.12.13
BLOCK		SHEET	76







THE \(\bigcel\) SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE \(\bigcel\) SYMBOL MARK OF THE SCHEMETIC.



MODEL	DATE	
BLOCK	SHEET	



2012 LED/LCD TV Engineering guide

< Applicable Model > XXLM760S-ZB



New features
Main PCBs
Block Diagrams, IIC Map
Structure of TV set and connection of sub ass'ys
New sub ass'ys

- Instruction of new sub ass'ys
- How to use tool
- Download

Adjust way of new features (widevine...)

Repair guide

The latest issue and concerning issue

EPI Interface

- EPI(Embedded Point-Point Interface)
- Features
 - Point-Point topology (support 2 Pair option)
 - CDR (Clock Data Recovery)
 - Bandwidth up to 1.85Gbps/pair at FHD 120Hz 10 bit application
 - Lock signal cascading and feedback to T-Con
 - Embedded Control Data
- Merits
 - Better reliability on common noise
 - No data skew and better EMI margin
 - Fewer lines than mini-LVDS
 - Slim PCB design

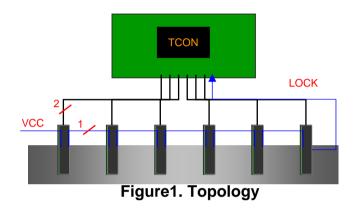


Table 1. Example of FHD 120Hz TV

FPI	FHD (10bit) @ 960Ch			
LII	60Hz	120Hz	240Hz	
Transmission Line	12	12	24	
Bandwidth	0.84Gbps	1.68Gbps	1.68Gbps	

EPI Interface (mini-LVDS vs. EPI)

Comparison

HF mini-LVDS

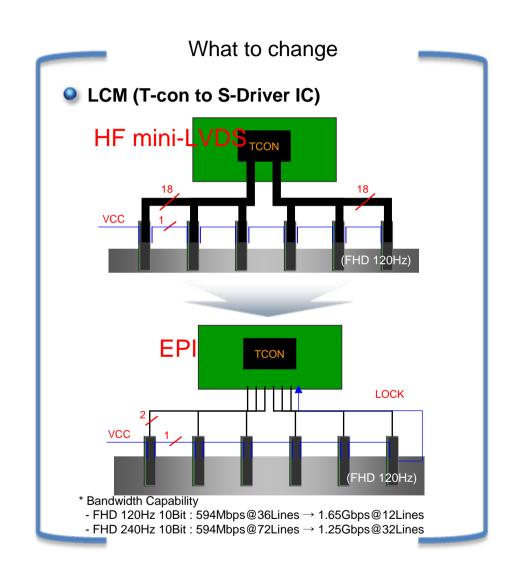
HF mini-	FHD (10bit)		
LVDS	60Hz	120Hz	240Hz
No. of Signal	36	36	72
Connector	60pin (2ea)	60pin (2ea)	80pin (2ea)

- -Difficult to upgrade bandwidth limit
- -Multiple number of wires needed for higher bandwidth

EPI (Embedded clock P-to-P Interface)

	FHD (10bit)		
EPI	60Hz	120Hz	240Hz
	960ch	960ch	720ch
No. of Signal	12	12	32
Connector	-	50 pin (2ea)	70pin (2ea)

- -Better reliability on common noise
- -No data skew. Better EMI margin
- -Lower cost (Cable, Connector)
- -Slim S-PCB design (14mm → 10mm) helps slimmer TV



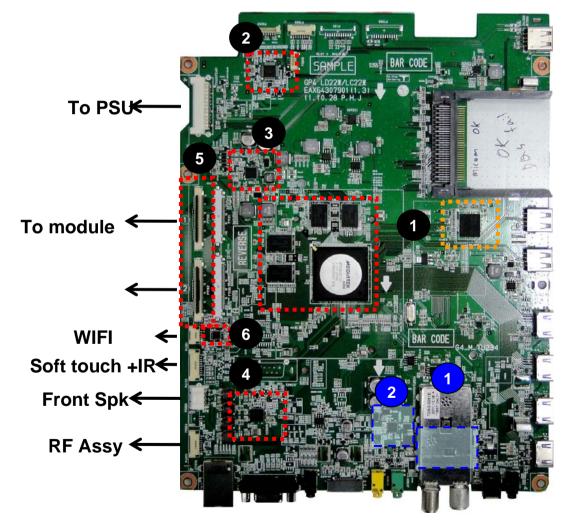
EPI Interface (mini-LVDS vs. EPI)

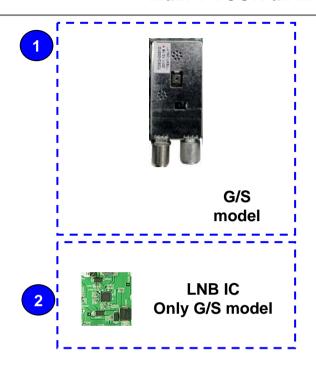
	HF mini-LVDS	EPI
Topology	TCON	TCON Lock
Protocol	RLV0	LVA(+)
Features @10bit, FHD120	Multi Drop Data rate: 660Mbps External clock	Point to Point Data rate: 1.8Gbps Embedded clock, Control
Merit	Simple structure Standardization	Fewer Lines: 12 Embedded clock : low EMI, Clock skew free Easy to PCB design
Demerit	Too many lines : 36Clock skewEMI due to clock linesBandwidth limit	Transmission Overhead : 4bit delimiter

xxLM760S-ZB

Chassis: LD22E

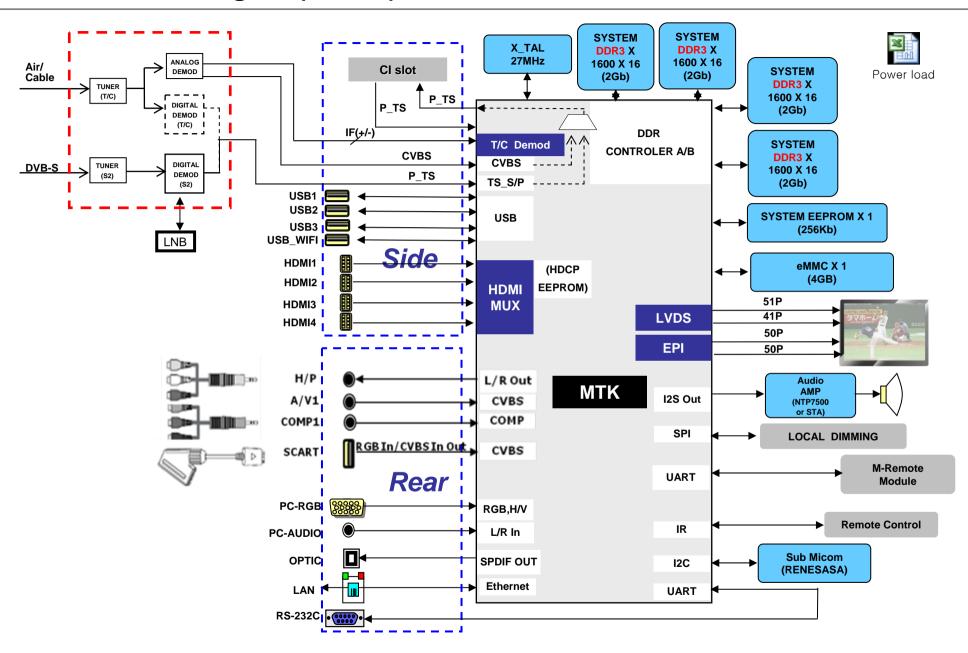
PCB P/No: EAX64307905



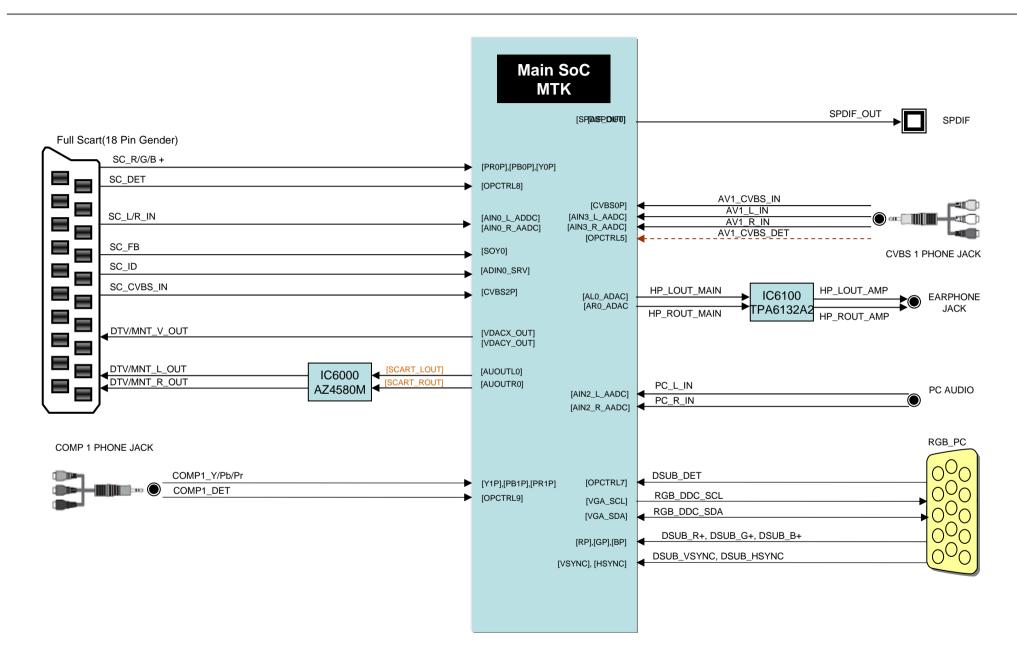


- Main processor, DDR Memory eMMC Memory
- 2 Micom for Key/IR sensing
- 3 PMIC
- 4 Audio AMP (10W+10W)
- 5 EPI Wafer
- 6 Level shifter

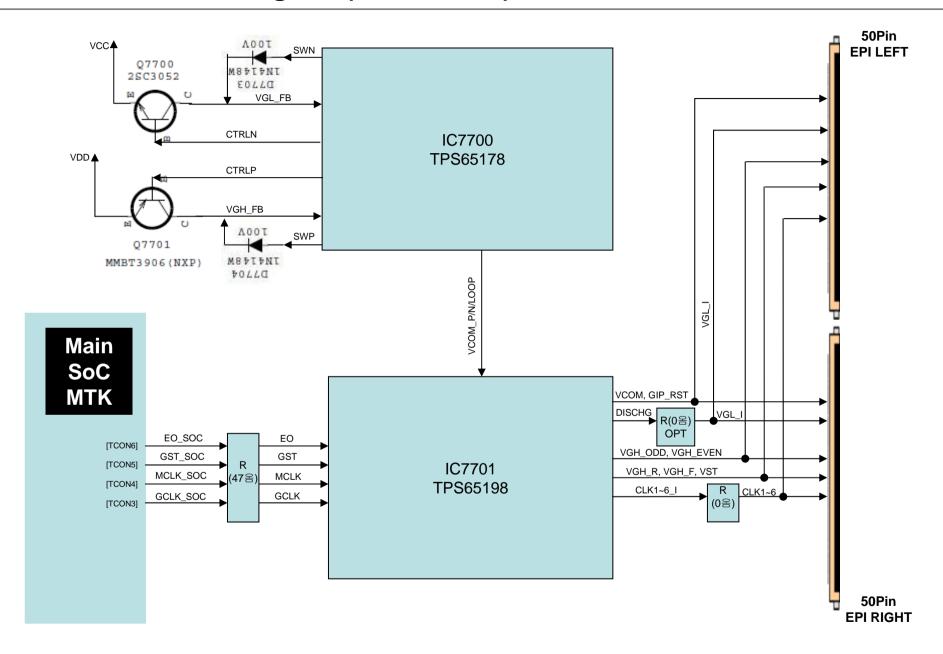
MTK5369 Block Diagram(LM76)



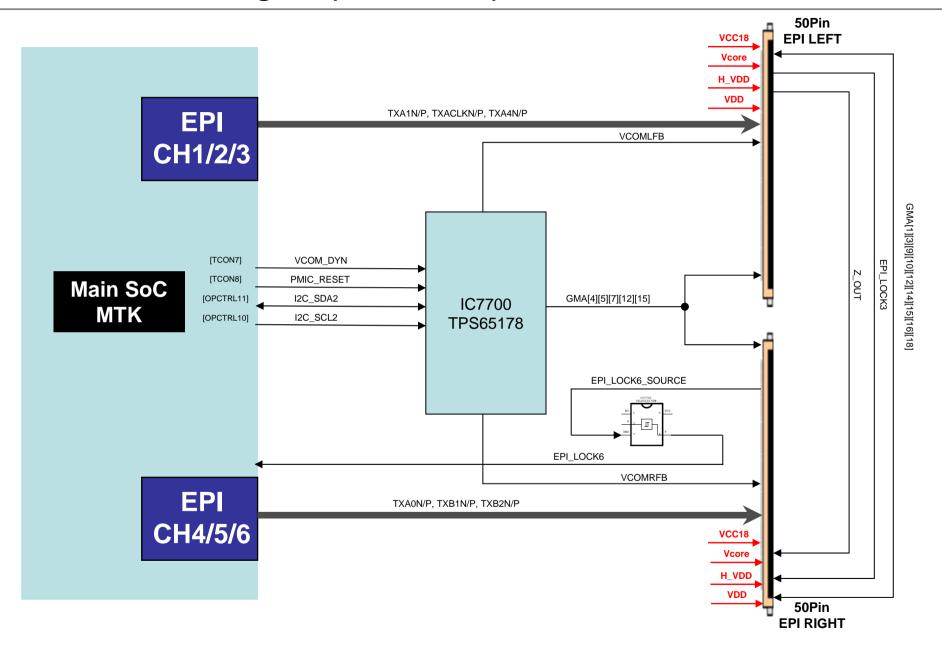
Jack Interface



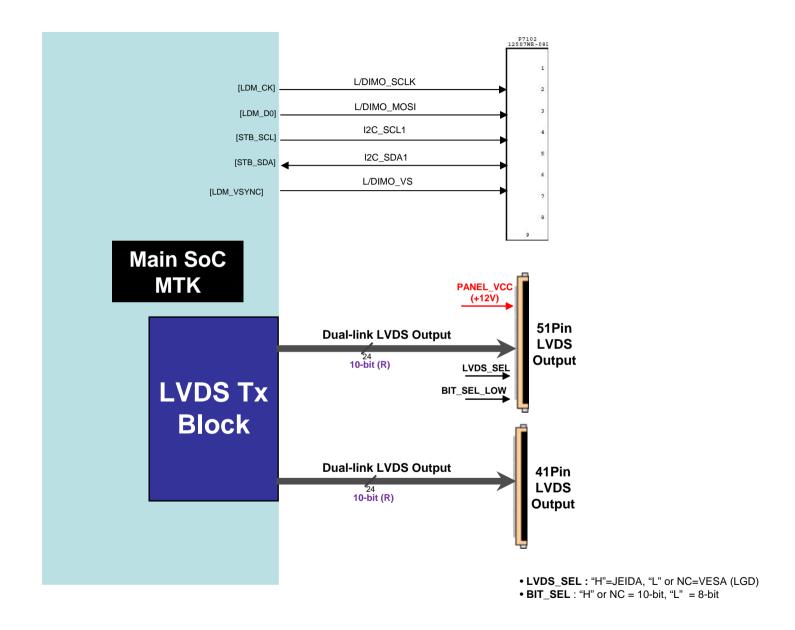
GP4 Backend block diagram (EPI & T-con)



GP4 Backend block diagram (EPI & T-Con)

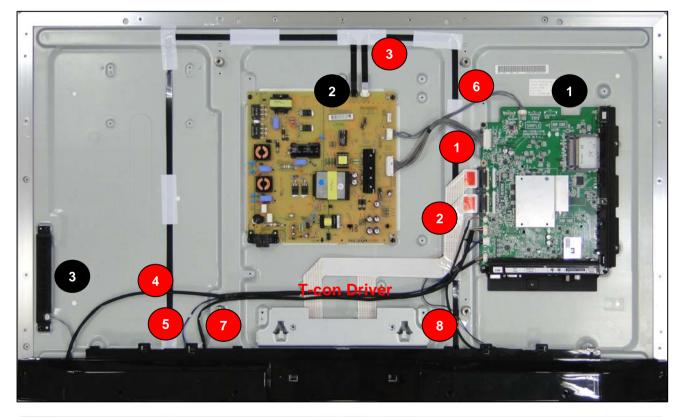


GP4 Backend block diagram (LVDS Tx & Local Dimming)



Interconnection - 1

xxLM760S-ZA





[PCBs]

- 1 Main PCB
- 2 Power Board
- 3 Tact key PCB
- 4 RF Assy
- 5 WIFI Assy

[Cables]

- Main / LPB 24Pin cable
- Main / Module EPI cable 50& 50PIN
- 3 LED driver / PSU
- 4 10Pin (IR+Touch) Cable
- 5 SPK Cable
- 6 Local Dimming Cable
- 7 RF Assy Cable
- 8 WIFI Assy Cable

Circuit Block Diagram KEY1, KEY2 Voltage (Tolerance of voltage $\pm 0.2V$) GPIO POWER INPUT MENU ENTER VOL+ VOL-CH+ CH-Parameter LED KEY1 0.58V 0.09V 1.75V 1.18V 0 KEY2 0.58V 1.75V 0.09V 1.18V **Ambient** I2C Sensor N **Ass'y Picture** CM3231 TV MAIN \mathbf{E} TOP **IR Receiver** KSM-903SMR1CL 0 KEY 1.2 R **BOTTOM Touch IC** ANSG08QL I2C **Pin Configuration** SCL 3.5V ST 6 SDA GND GND RED LED 3 8 KEY1 9 IR KEY2 10 GND

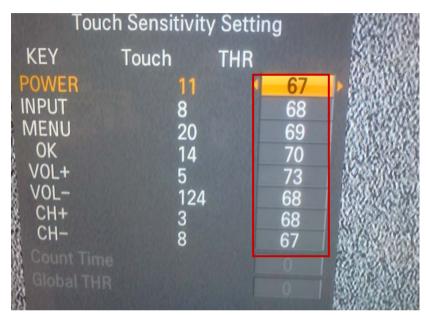
2012Y IR + Soft Touch LED Lighting Scenario

Power LED Scenario

	구분		Spec 내용	비고
Power Indicator UI			- 12Y GP4 High(L9), GP4 Mid(MTK), GP4 Low(S7LR2) → "Power Light" UI Delete compared with 11Y(GP3 model) - 11Y Carry Over Model: 12Y same Power LED scenario process → "Power Light" UI Delete, The way of 11Y Soft Touch Ass'y is used. White LED Disable	-
		Power On	- Stand-By condition to Red LED On : After DC ON, Red LED light Blinks twice and then Red LED is Off - Stand-By condition to Red LED Off : After DC ON, Red LED light Blinks three times and then Red LED is Off	
	User Condition	Power Off	- Without Blink, Red LED On immediately But, If the mode of Power Indicator UI is Stand-By, keep staying Red LED Off status	-
		Remote Key input	- When you put the remote Control button, Red LED Blinks once	-
GP4 (High/Mid/Low)		Warm Stand-by	- Red LED On stays and In the case of Set On, Red LED turns Off → Including DVR Ready model, Japanese model	Same as the 11Y
Power LED Scenario		3D mode	- Red LED Off (Power On condition is identical)	Same as the 11Y
	Factory Condition	Factory Default Mode (In-Stop)	- 12Y LED Model: Stand-By On (Red LED On) - 12Y CCFL Model: Stand-By On (Red LED On) - 11Y Carry Over Model (CS5XX/CM5XX): Stand-By On (Red LED On) - After In-Stop, Red LED On is processed and after In-Stop, Red LED turns on within 3 sec	-
		Power Only Mode	- In the case of Power Only On, Red LED turns Off - In the case of DC Off, Red LED turns On	-

Introductions of GP4 Sensor (Touch IC)

Manual of Touch Sensitivity



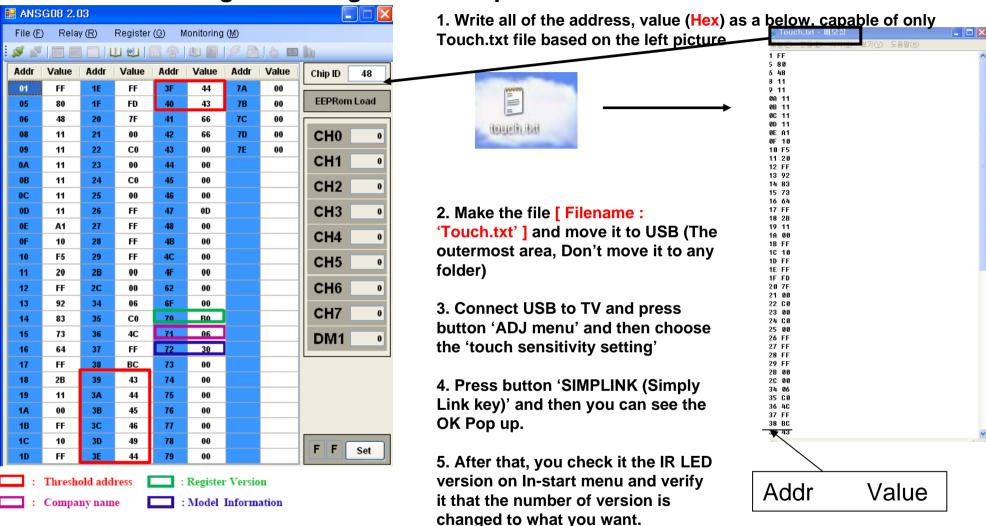
- 1. Verify the number of THR at first.
- 2. Once you correctly touch Touch button for more than 1 sec, you can see a Touch data while you keep touching the button.
- 3. Keep in mind that you can only read the Touch data during touch status.
- 4. It doesn't matter that Touch data gets low value after taking off your finger.

Touch Key Threshold Level (Ta = 25°C)

Parameter	POWER	INPUT	MENU	ENTER	VOL+	VOL-	СН+	CH-
Sensitivity	67	68	69	70	73	68	68	71

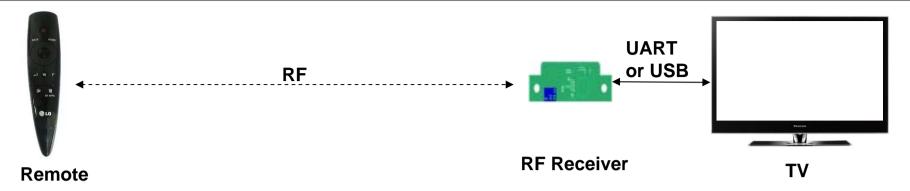
Introductions of GP4 Sensor (Touch IC)

Touch EEPROM Register change with USB port



Introductions of 12Y RF ass'y + Magic Remote control

1. System



❖ Pairing Information Transmission (Send to TV after Paired)

- Static Calibration Data (Bypass only)
- Remote FW ver. (Save also in Receiver)
- BD_ADDR (Save also in Receiver)

• Pairing Information Transmission Sequence

- When it is paired, the remote sends packets(pairing success, F/W version, BD_ADDR) to the receiver.
- The receiver sends the pairing success packet to TV directly.
- F/W version and BD_ADDR packets are just saved on the receiver.
- The receiver sends F/W version or BD_ADDR packet to TV when it is required.

❖ Motion Data Transmission

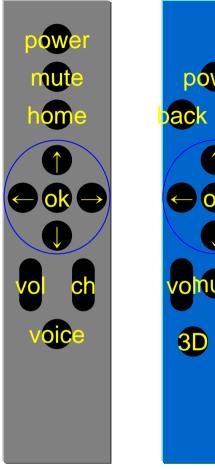
- Period: 7.5msec
- Motion Data : gyro, accelerometer

❖ Voice Data Transmission

- Period : 10msec
- Voice sampling: 16khz 16bit

→ See "6-2. Packets" on page 8.

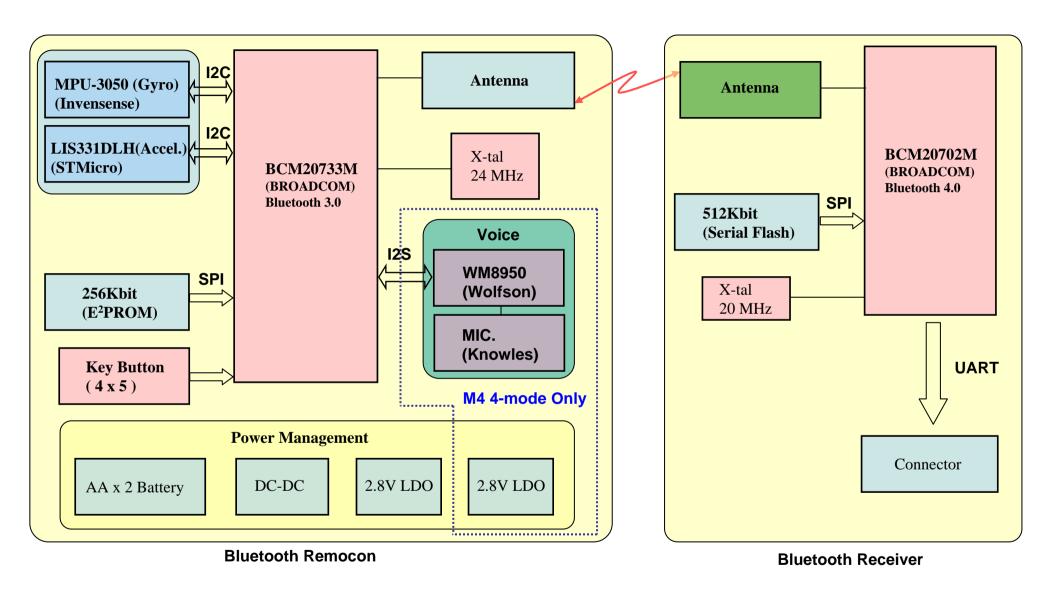
2. Remote Buttons (M3 vs. M4)



M3 Remote	M4 Remote

BUTTON		RF Unpaired IR_CODE	RF Paired RF_CODE	IR continuous repeat	ETC.
	POWER	0x08	0x08	Υ	IR only
	BACK	0x28	0x8028	Υ	
	HOME	0x7C	0x807C	Υ	
	←	0x07	0x8007	Υ	
	\rightarrow	0x06	0x8006	Υ	
	\uparrow	0x40	0x8040	Υ	
	\downarrow	0x41	0x8041	Υ	
Phsical	OK	0x75	0x8044	Υ	
Buttons	CH+	0x00	0x8000	Υ	
	CH -	0x01	0x8001	Υ	
	VOL+	0x02	0x8002	Υ	
	VOL -	0x03	0x8003	Υ	
	MUTE	0x09	0x8009	Υ	
	3D_Mode	0xDC	0x80DC	Υ	
	MyAPPS	0x42	0x8042	Υ	
	VOICE		0x800A	Υ	= VOICE_START
Logical Buttons	AUTO_WAKEUP	X	0x800C		
	VOICE_START	X	0x800A		
	VOICE_STOP	Χ	0x800D		
	POINT_START	Χ	0x803E		
	POINT_STOP	Χ	0x803F		

3. M4 Block Diagram



4. Function list

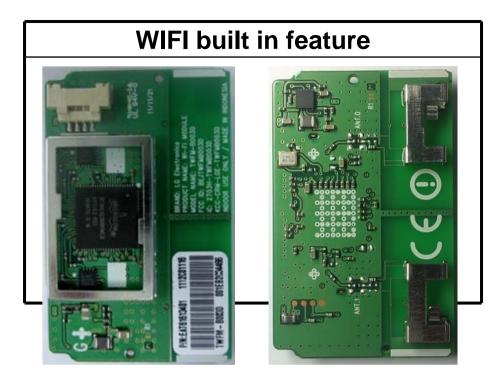
주요 Item		IC	Manufacturer	Function		
	Voice	Voice Codec	WM8950	Wolfson	16KHz Sampling of Audio data	
	Voice	MEMS Mic.	SPU0414HR5H	Knowles	Sensing Voice	
	Motion	Gyro Sensor	ITG3050	Invensense	Sensing angular velocity of X, Y, Z-axis	
	Sensor	Accelerometer	MMA8452	Stmicro	Sensing device tilt (Pitch & Roll angle)	
Damasan.	DE	RF Antenna	SDBTPTR3015	Partron	Wireless communication	
Remocon RF + Micom	+	X-tal	24MHz	Partron		
	Micom	RF + Micom	BCM20733	Broadcom		
DC-D		C Converter	TPS61097	TI	Battery Boost up Regulator	
		LDO1	uPI7716	uPI	RF, Gyro, Accelerometer Power Supply	
		LDO2	uPI7716	uPl	Audio Codec, Mic. Power Supply	

5. RF Pairing / Un-pairing Method

	Method	Description		
RF Pairing	 Method1 If unpaired, just press "OK" button. If paired, press "OK" button after unpairing. Method 2 (Repairing) Press "BACK" button for 5 sec. 	 When do pairing, the remote should make pairing request IR signal(0x29) to TV. When TV receive the IR signal, it should send "pairing request packet" to the RF receiver. After pairing success, the remote should blink LED for some time and TV send "pairing success packet" back to TV. When remote try to unpairing, it depends to a respect to the remote of the remote should be a remote of the remote o		
		doesn't care about state of receiver(stand alone).		
RF Unpairing	Press "HOME" button and "BACK" button at the same time for 5 sec.	 When remote try to unpairing, it doesn't care about state of receiver(stand alone). 		
		 After unpairing, all pairing information should be erased. 		
		 After unpairing, LED should be blinked for 3sec. 		
		The remote just becomes to IR mode.		

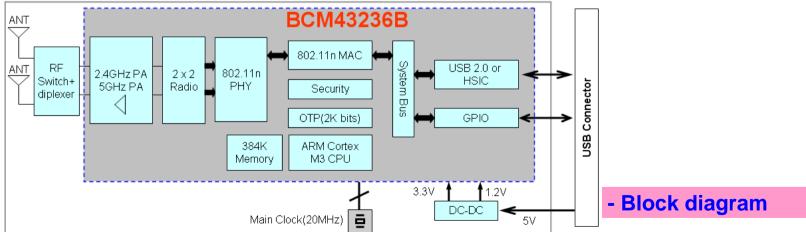
Introductions of 12Y WIFI built in ass'y

WIFI Built in ass'y feature(LGIT)

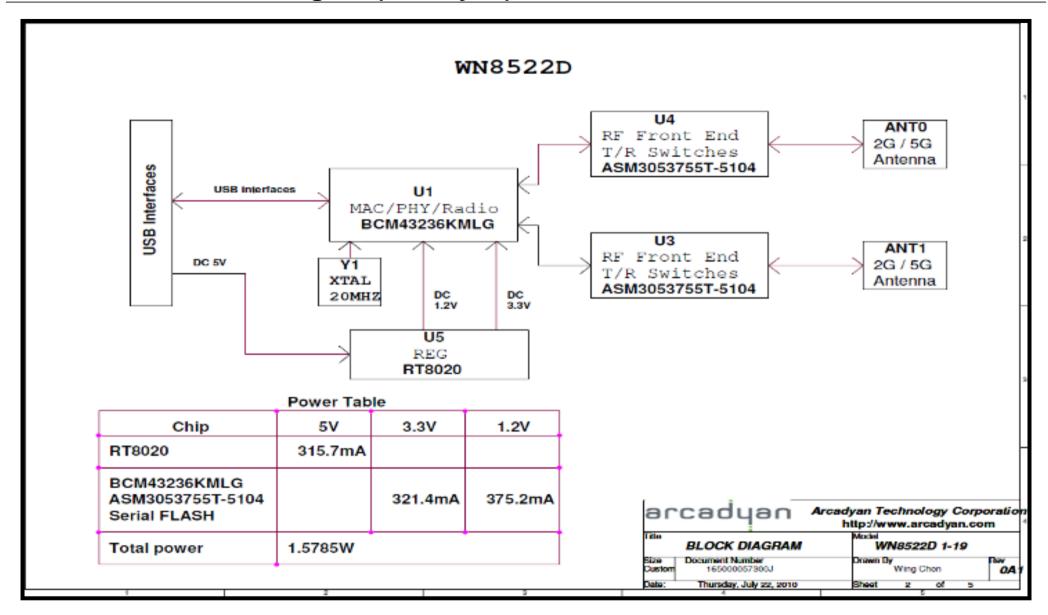


- Pin map

PIN	USB interface
1	5V
2	DM
3	DP
4	GND



WIFI Built in Block-diagram(Arcadyan)



WIFI Built in ass'y Specification

Frequency Band:

Draft 802.11n Radio: 2.4 GHz 802.11g Radio: 2.4 GHz 802.11b Radio: 2.4 GHz

> USA - FCC 2412~2462MHz (Ch1~Ch11) Canada - IC 2412~2462MHz (Ch1~Ch11) Europe - ETSI 2412~2472MHz (Ch1~Ch13) 2412~2484MHz (Ch1~Ch14)

Japan – STD-T66/STD-33

802.11a Radio: 5 GHz

5.150~5.250GHz 5.725~5.850GHz

Operating Channels:

IEEE 802.11b/g/n compliant:

11 channels (US, Canada) 13 channels (ETSI) 14 channels (Japan)

Transmit Power and Sensitivity:

TX Output Power:(Typical) (Meet emission standard)

17 +/- 2 dBm

112 14 +/- 2 dBm@54Mbps (Each chain)

13 +/- 2 dBm (Each chain)

Rx Sensitivity:(Typical)

-69dBm at HT20 m7 2.4GHz

-87dBm at HT20 m0 2.4GHz

-69dBm at HT20 m7 5.0GHz

-87dBm at HT20 m0 5.0GHz

Modulation

DBPSK @1Mbps DQPSK@2Mbp CCK@5.5/11Mbps BPSK@6/9 Mbps

QPSK@12/18Mbps

16-QAM@24Mbps

64-QAM@48/54Mpb and above

Current consumption(5V DC):

Full load: 430mA

Operating Temperature: 0 ~ 60 °C ambient

Storage Temperature: -20 ~ 60 °C ambient

Humidity: under 85% and must be non-condensing

Regulation and certification compliance available:

CE.

FCC

WiFi



WPS







12Y Widevine & HDCP 2.0 & NETFLX

- 1. Widevine?
- 2. **HDCP 2.0 & NETFLIX?**
- 3. DTCP?
- 4. Changed BOM

1. Widevine?

[Widevine]

Widevine is the Solution(Library) offering Adaptive Streaming and DRM.

In BBTV, when special CP do service, this module is required key.

Currently CP which is requested to widevine, is typically Australian Bigpond Live and North American CinemaNow.

Furthermore, because the future will be the spread of CP, widevine key download for the global model should be applied to production.

(Because operation unique key should be downloaded for Widevine , Widevine key download by NSU is impossible.)

[Widevine Key]

Widevine Key is unique data stored TV for using Widevine.

2. **HDCP 2.0 & NETFLIX?**

□ HDCP





- ✓ Protect high-value digital motion pictures, television programs and audio against unauthorized interception and copying between a digital set top box or digital video recorder and a digital TV or PC.
- ✓ Specification developed by Intel Corporation to protect digital entertainment across the DVI/HDMI interface.
- Why HDCP2.0?
- ✓ HDCP revision 2.0 supports a broader range of wired and wireless interfaces.
- □ Netflix
- ✓ the services maintain a huge selection of movies and latest releases and offer DVD rentals via mail & online streaming.

3. DTCP?

[DTCP]

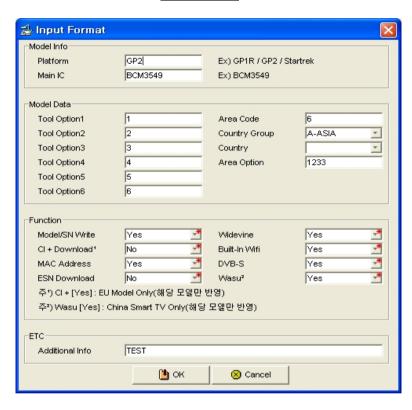
The Digital Transmission Content Protection Specification defines a cryptogrphic protocol for protecting audio/video entertainment content from unauthorized copying, intercepting, and tampering as it traverses digital transmission mechanisms such as a high-performance serial bus that conforms to the IEEE 1394-1995 standard. Only legitimate entertainment content delivered to a source device via another approved copy protection system (such as the DVD Content Scrambling System) will be protected by this protection system.

[Three cryptographic Keys]

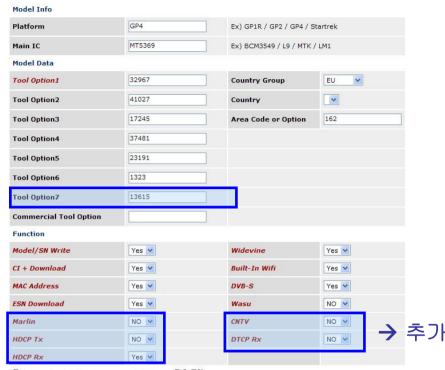
- Authentication Key which is formed as a result of authentication and used to protect the exchange keys.
- •Exchage Key which is used to set up and protect content streams.
- •Content Key which is used to encrpt the content being exchanged.

4. Changed BOM

As-Was



Current



주3) CNTV [Yes]: China Smart TV Only(CNTV ID 필요 모델)

O Add Item

- 1.Marlin (Yes/No)
- 2.CNTV (Yes/No)
- 3.HDCP Tx (Yes/No)
- 4.DTCP Rx (Yes/No)
- 5.HDCP Rx (Yes/No)
- 주3) CNTV [Yes]: China Smart TV Only

4. Changed BOM

	Tool Option	bits	Range	Remark	Guide
×	Mac_AP Key	1	0/1 0:off 1:on	Automation checkup	Check whether or not key write
	ESN_AP Key	1	0/1 0:off 1:on	Automation checkup for Netflix Service	MAC-AP:Global
	CI_AP Key	1	0/1 0:off 1:on	Automation checkup	ESN AP:Global(Except China)
	WIDEVINE_AP Key	1	0/1 0:off 1:on	Automation checkup for CP or 3D Zone Steaming Service	CI AP:EU/CIS
Tool OPT7 (Automation	Marlin_AP key	1	0/1 0:off 1:on	Automation checkup	WIDEVINE_AP:Global
	EDID_TPE	2	0:PCM 1:AC3 2:Rewerved	10 -0.41-0.41-0	MARLIN_AP:Japan only
	LED Current	2	0/1/2/3/4 0: 85mA 1: 100mA 2: 105mA 3: 130mA	Setting PWM Duty each Module	Setting each model's Spec
Checkup)	LED Bar Type(LCD Only) Pen Touch Tv(PDP Only)	2	LCD: V_12B,V_6B,H_12B,H_6B PDP: Off,Ready, BuitIn,NULL	LED Bar (LCD Only) Pen touch (PDP Only)	In case of LPB(Tool OPT4/Power Type), This tool is valid.
	DiiVa	1	0/1		In case of LPB(Tool OPT4/Power Type), This tool is valid.
	XvYcc	1	0:not Support 1:Support	Check whether or not support of Module Color Gamut XvYCC	China: ON, Global(Except china):OFF
	MRCU	1	0:not Support 1:Support	Check whether or not support of Voice recognition function	Setting each Module
	Gesture	1	0:not Support 1:Support	Check whether or not support of gesture recognition function	
	PWM_Freq	1	0:50_60Hz 1:PWM_DB	Setting each Module	L9:ON, MTK:Off
	Sum of bits	16	Full Assign		

Contents of LCD TV Standard Repair Process

No.	Error symptom (High category)	Error symptom (Mid category)	Page	Remarks
1		No video/Normal audio	1	
2		No video/No audio	2	
3	A. Video error	Video error, video lag/stop, fail tunning	3, 4	
4		Color error	5	
5		Vertical/Horizontal bar, residual image, light spot, external device color error	6	
6		No power	7	
7	B. Power error	Off when on, off while viewing, power auto on/off	8	
8	C Audio orror	No audio/Normal video	9	
9	C. Audio error	Wrecked audio/discontinuation/noise	10	
10	D. Function error	No response in remote controller, key error, recording error, memory error	11	
11		External device recognition error	12	
12	E. Noise	Circuit noise, mechanical noise	13	
13	F. Exterior error	Exterior defect	14	

First of all, Check whether there is SVC Bulletin in GCSC System for these model.

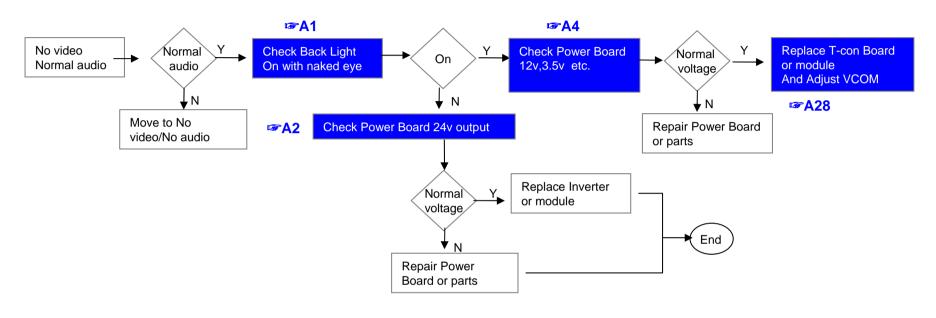
Contents of LCD TV Standard Repair Process Detail Technical Manual

No.	Error symptom	Content	Page	Remarks
1		Check LCD back light with naked eye	A1	
2	A Video over Nevideo/Nevreloudie	LED driver B+ 24V measuring method	A2	
3	A. Video error_ No video/Normal audio	Check White Balance value	А3	
4		Power Board voltage measuring method	A4	
6	A Mides error Newides Mides log/otes	TUNER input signal strength checking method	A6	
7	A. Video error_ No video/Video lag/stop	LCD-TV Version checking method	A7	
9		LCD TV connection diagram	A8	
10		Tuner Checking Part	A9	
11	A. Video error_Color error	Check Link Cable (LVDS) reconnection condition	A10 A11	A10 : 32/37/42/47/55 A11 : 32 AUO
12		Adjustment Test pattern - ADJ Key	A12	
13		LCD TV connection diagram	A8	
14	A. Video error_Vertical/Horizontal bar, residual image, light spot	Check Link Cable (LVDS) reconnection condition	A10 A11	A10 : 32/37/42/47/55 A11 : 32 AUO
15		Adjustment Test pattern - ADJ Key	A12	
16		Exchange T-Con Board (1)	A-1/5	
17	<appendix></appendix>	Exchange T-Con Board (2)	A-2/5	
18	Defected Type caused by T-Con/ Inverter/ Module	Exchange LED driver Board (PSU)	A-3/5	55" : driver board Other : PS
19		Exchange Module itself (1)	A-4/5	
20		Exchange Module itself (2)	A-5/5	

Continue to the next page

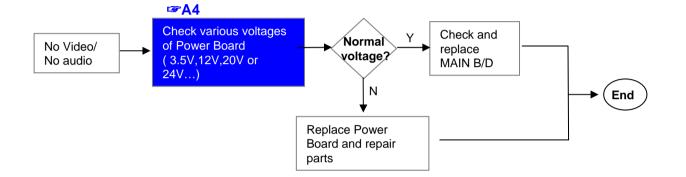
	Standard Repair Process							
	LCD TV	Error symptom	A. Video error	Established date	2010. 12 .14			
			No video/ Normal audio	Revised date		1/13		

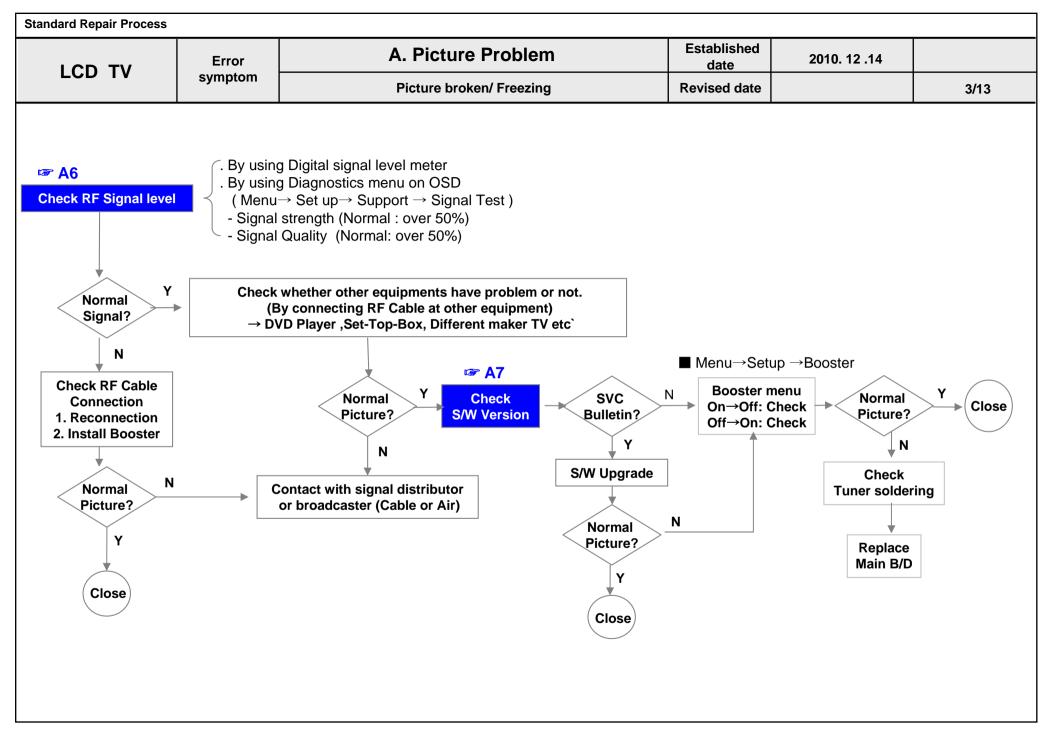
First of all, Check whether all of cables between board is inserted properly or not. (Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,,)

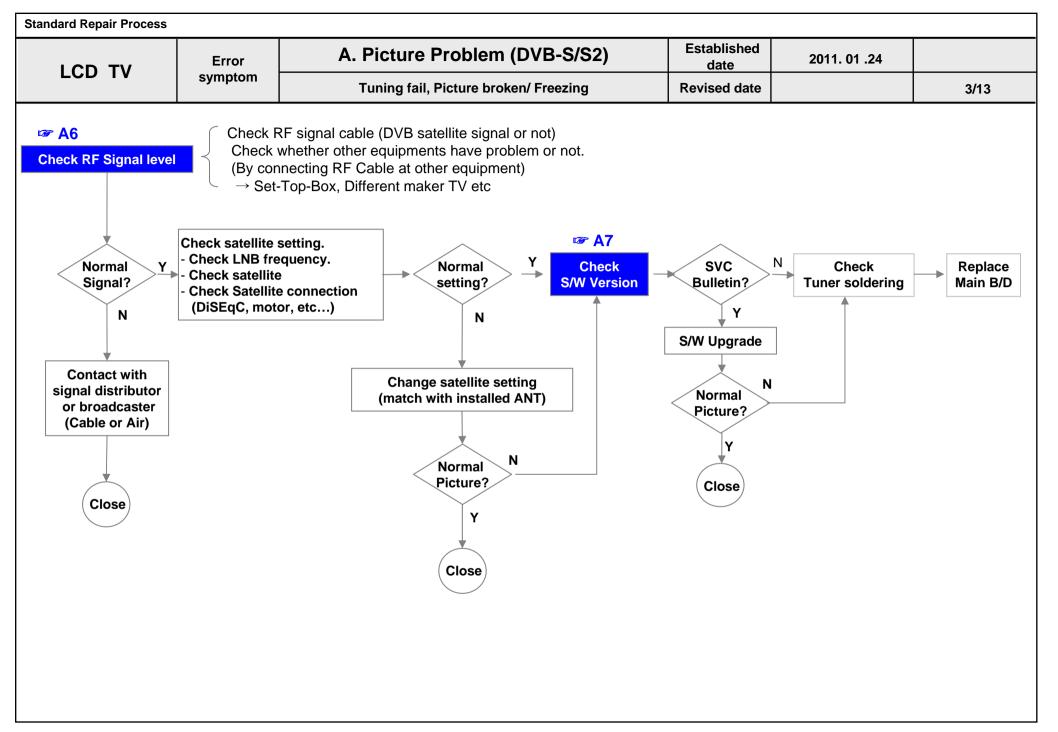




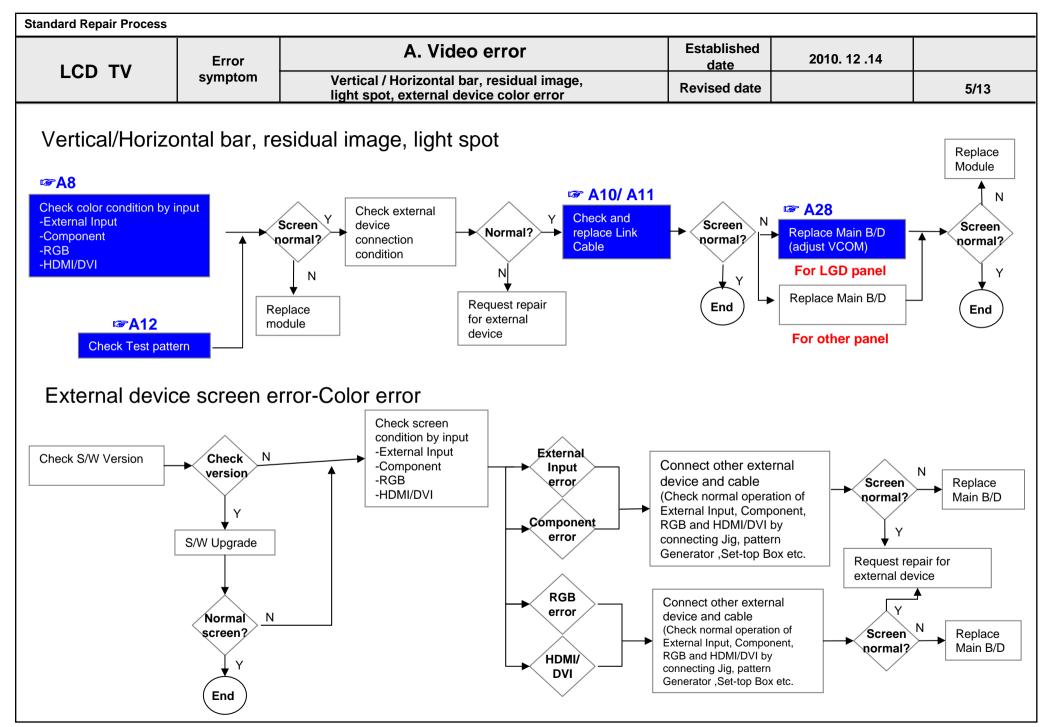
Standard Repair Process						
LCD TV	Error symptom	A. Video error	Established date	2010. 12 .14		
		No video/ No audio	Revised date		2/13	
		-	-	•		

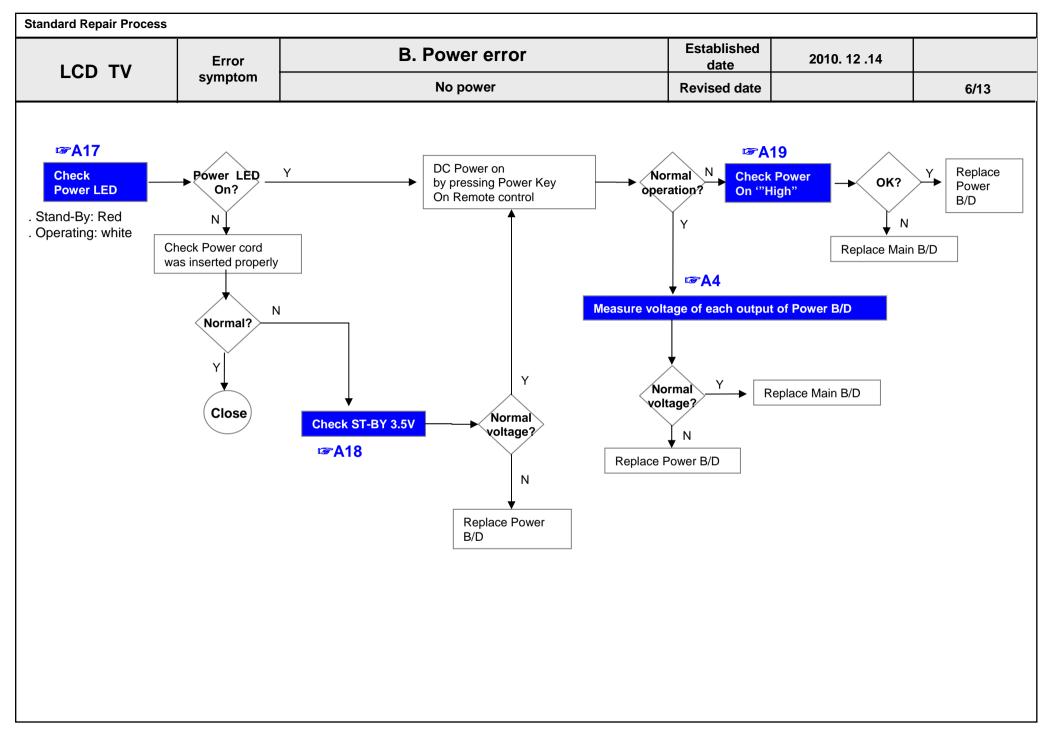


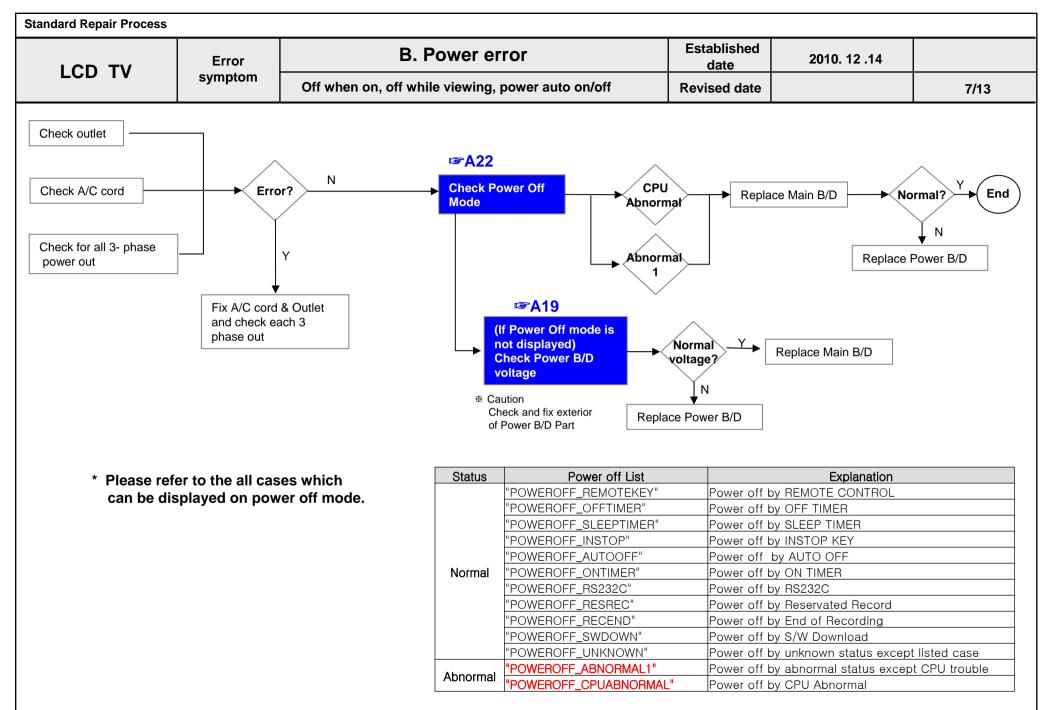


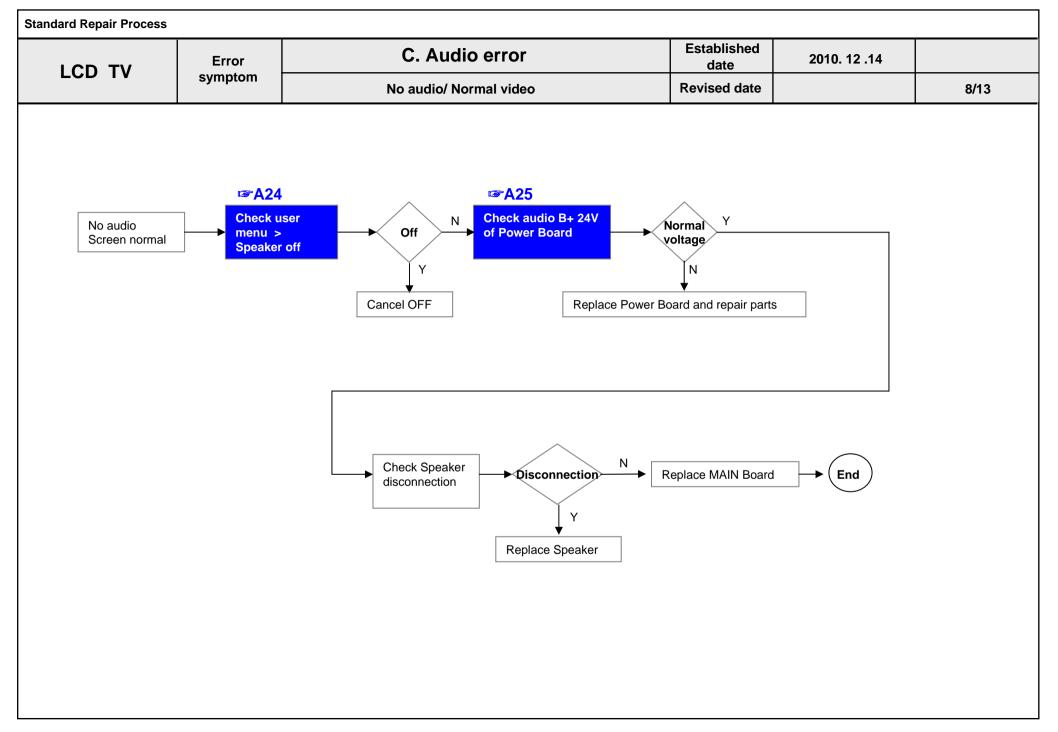


LCD TV	Error	A. Video error	Established date	2010. 12 .14	
LCD TV	symptom	Color error	Revised date		4/13
Check color be -External Input -COMPONENT -RGB -HDMI/DVI	ut √T	Color error? Check error color input mode External Input/ Component error error Check external device and cable	External device y /Cable normal N Request repair	? Replace modul	e
		RGB/ HDMI/DVI error Check external device and cable	for external device/cable N	Replace Main B/D	

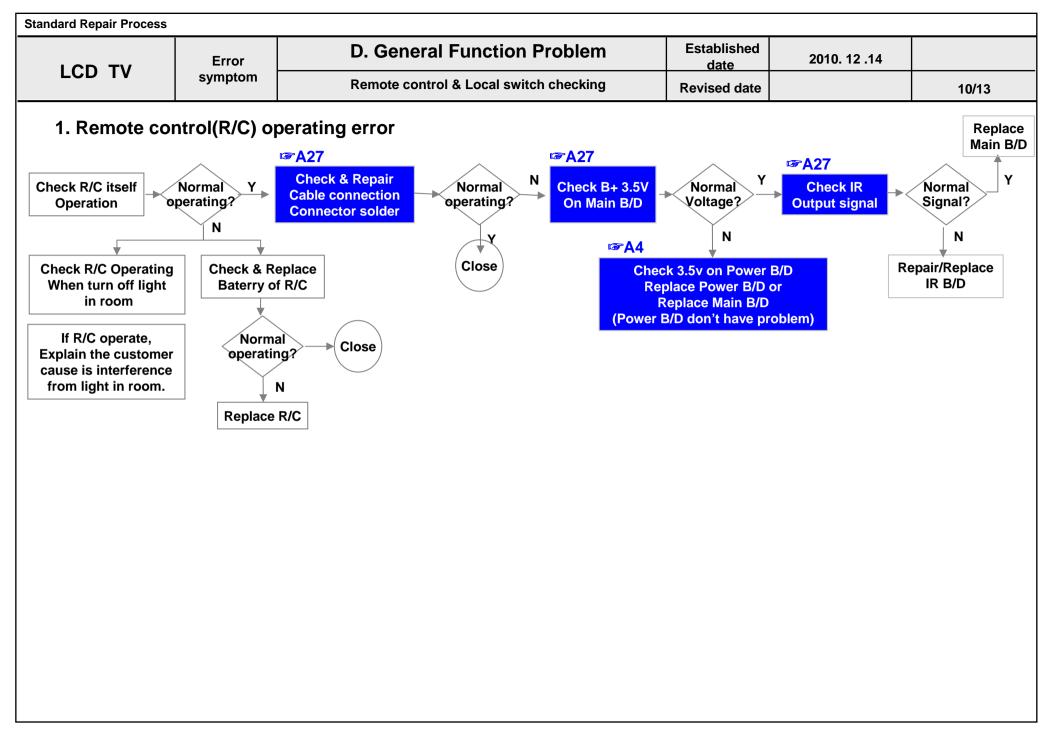




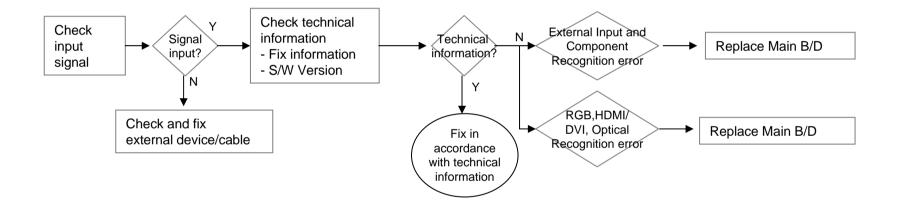




	ror	C. A	udio error	Established date	2010. 12 .14	
Sym	ptom	Wrecked audio/	discontinuation/noise	Revised date		9/13
→ abnormal	l audio/dis	scontinuation/noise	e is same after "Check inpu	ıt signal" compare	d to No audio	
neck input gnal F xternal Input gnal	(When RI received) Request I cable/AN	repair to external T provider of External hal error) hd fix	Wrecked audio/ Discontinuation/ Noise only for D-TV Wrecked audio/ Discontinuation/ Noise only for Analog Wrecked audio/ Discontinuation/ Noise only for External Input Connec	Replace Main B/D Replace Main B/D Reck and check external device Check and fix external device	dio?	End

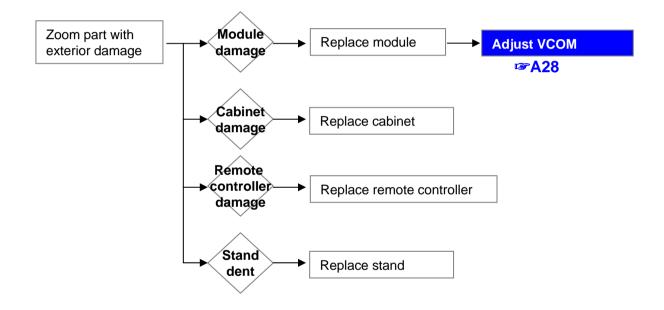


Standard Repair Process						
LCD TV	Error symptom	D. Function error	Established date	2010. 12 .14		
		External device recognition error	Revised date		11/13	



LCD TV	Error	E. Noi	se	Established date	2010. 12 .14	
	symptom	Circuit noise, mec	hanical noise	Revised date		12/13
Identify nose typ	* Mechanica noise * Mechanic phenomenor description. Vagree, apply * Describe	Check location of noise Check location of noise Check location of noise al noise is a natural n, and apply the 1st level When the customer does not the process by stage. the basis of the description in to nose" in the Owner's Manual.	Replace LED driv	·	from the cabinet, and then proceed al	

Standard Repair Process						
LCD TV	Error symptom	F. Exterior defect	Established date	2010. 12 .14		
		Exterior defect	Revised date		13/13	



Contents of LCD TV Standard Repair Process Detail Technical Manual

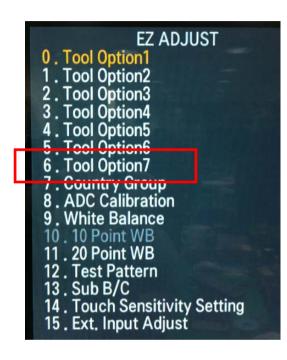
Continued from previous page

No.	Error symptom	Content	Page	Remarks
21		Check front display LED	A17	
22		Check power input Voltage & ST-BY 5V	A18	
23	B. Power error_No power	Checking method when power is ON	A19	
24		POWER BOARD voltage measuring method	A4	
25				
26	B. Power error_Off when on, off while viewing	POWER OFF MODE checking method	A22	
27	B. Power error_Off when on, off while viewing	POWER BOARD PIN voltage checking method	A19	
28		Checking method in menu when there is no audio	A24	
29	C. Audio error_No audio/Normal video	Voltage and speaker checking method when there is no audio	A25	
30	C. Audio error_Wrecked audio/discontinuation	Voltage and speaker checking method in case of audio error	A25	
31	D. Function error_ No response in remote controller, key error	Remote controller operation checking method	A27	
32	D. VCOM Adjustment	Sequence of the Vcom adjustment	A28	

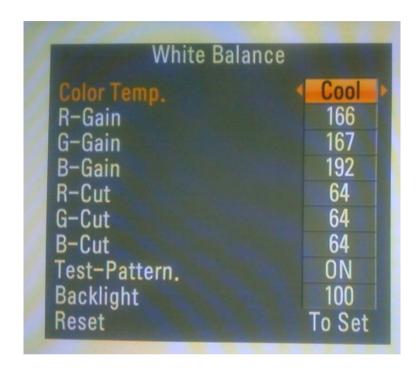
LCD TV

Error symptom	A. Video error_No video/Normal audio	Established date	2010. 12 .14	
Content	Check White Balance value	Revised date		A4

<ALL MODELS>







Entry method

- 1. Press the ADJ button on the remote controller for adjustment.
- 2. Enter into White Balance of item 7.
- 3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), reenter the value after replacing the MAIN BOARD.



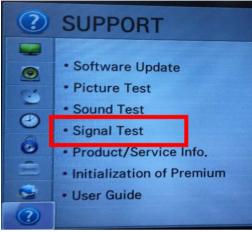
Check the DC 24V, 12V, 3.5V.

	24 Pin (Power Board ↔ Main Board)						
	SMAW200-H24S (YEONHO)						
1	Power on	2	24V				
3	24V	4	24V				
5	GND	6	GND				
7	GND	8	GND				
9	3.5V	10	3.5V				
11	3.5V	12	3.5V				
13	GND	14	GND				
15	GND	16	GND				
17	12V	18	Inverter On/off				
19	12V	20	Lamp : A-Dim LED : N.C				
21	12V	22	PWM Dim #1				
23	GND/P_DIM2 • Lamp SCANNING Model : PWM Dim #2	24	Error-out				

LCD TV

Error sympton	A. Video error_Video error, video lag/stop	Established date	2010. 12 .14	
Content	TUNER input signal strength checking method	Revised date		A6

<ALL MODELS>



(I) UHF Ch 51 Can not receive NIT. Signal Strength 58% Signal Quality Code Rate : 3/4 : 1/16 64QAM FFT Mode 800 TV ONE 801 TV2 803 TVNZ 7 802 TVNZ 6 804 TVNZ SPORT ... : 0x19 (DTV) Service Type : 0x4b0 Service ID Close

MENU -→ Set up → support -→ signal test -→ select channel

When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)



date

<ALL MODELS>

1. Checking method for remote controller for adjustment





Version

Press the IN-START with the remote controller for adjustment

Standard Repair Process Detail Technical Manual					
LCD TV	Error symptom	A. Video error _Vertical/Horizontal bar, residual image, light spot	Established date	2010. 12 .14	
	Content	LCD TV connection diagram (1)	Revised date		A8

<ALL MODELS>

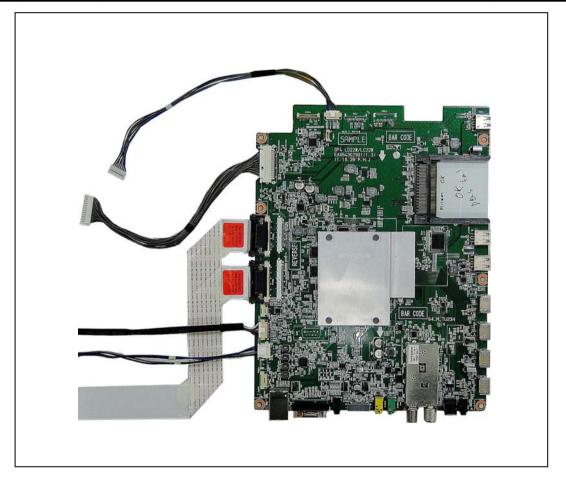


As the part connecting to the external input, check the screen condition by signal

LCD TV

Error symptom	A. Video error_Video error, video lag/stop	Established date	2010. 12 .14	
Content	TUNER checking part	Revised date		A9

<ALL MODELS>



Checking method:

- 1. Check the signal strength or check whether the screen is normal when the external device is connected.
- 2. After measuring each voltage from power supply, finally replace the MAIN BOARD.

LCD TV

Error symptom	A. Video error_Color error	Established date	2010. 12 .14	
Content	Adjustment Test pattern - ADJ Key	Revised date		A12

















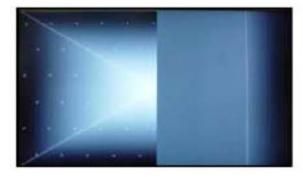
You can view 6 types of patterns using the ADJ Key

Checking item: 1. Defective pixel 2. Residual image 3. MODULE error (ADD-BAR, SCAN BAR...) 4. Video error (Classification of MODULE or Main-B/D!)

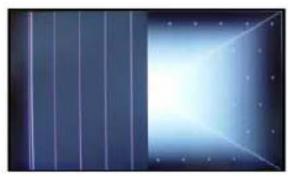
Appendix : Exchange T-Con Board (1)



Solder defect, CNT Broken



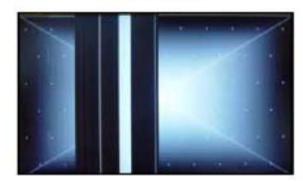
Solder defect, CNT Broken



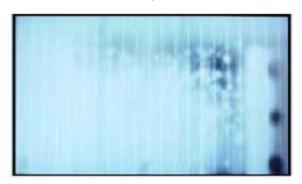
Solder defect, CNT Broken



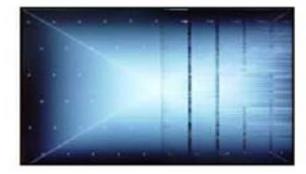
Solder defect, CNT Broken



Solder defect, CNT Broken



Abnormal Power Section



Solder defect, Short/Crack



Abnormal Power Section

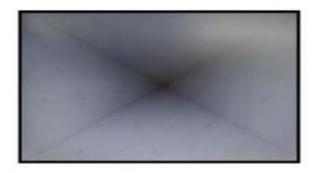


Solder defect, Short/Crack

Appendix: Exchange T-Con Board (2)



Abnormal Power Section



Abnormal Power Section



Solder defect, Short/Crack



Solder defect, Short/Crack



Fuse Open, Abnormal power section



Abnormal Display



GRADATION



Noise



GRADATION

Appendix : Exchange PSU(LED driver)



No Light



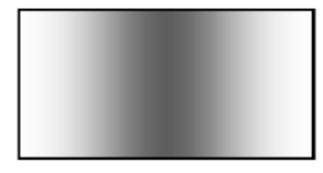
Dim Light



No picture/Sound Ok



Dim Light



Dim Light

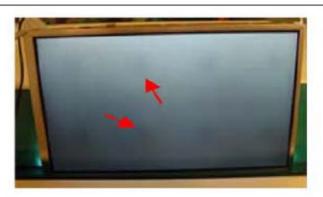
Appendix: Exchange the Module (1)



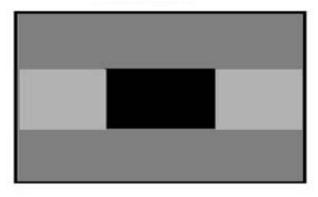
Panel Mura, Light leakage



Panel Mura, Light leakage



Press damage



Crosstalk



Press damage



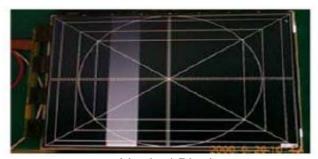
Crosstalk



Press damage

Un-repairable Cases
In this case please exchange the module.

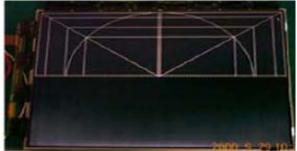
Appendix: Exchange the Module (2)



Vertical Block Source TAB IC Defect



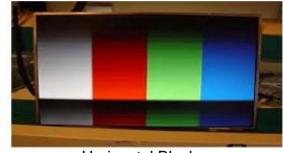
Horizontal Block Gate TAB IC Defect



Horizontal Block Gate TAB IC Defect



Vertical Line Source TAB IC Defect



Horizontal Block Gate TAB IC Defect

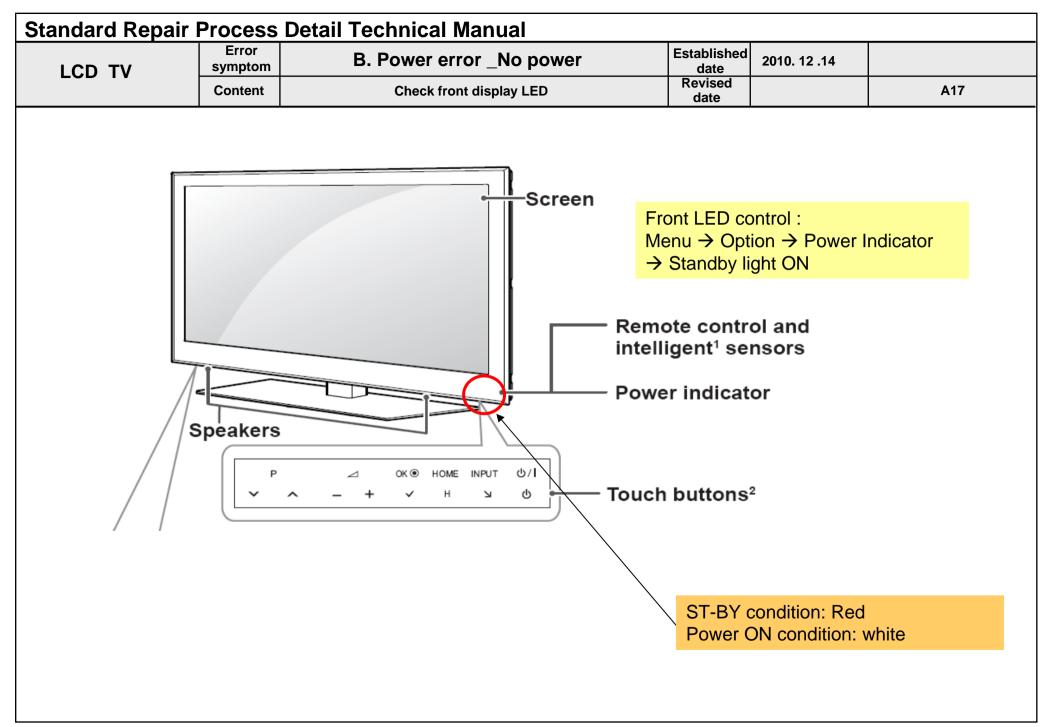


Vertical Block Source TAB IC Defect



Horizontal line Gate TAB IC Defect

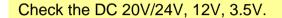
Un-repairable CasesIn this case please exchange the module.



LCD TV

Error symptom	B. Power error _No power	Established date	2010. 12 .14	
Content	Check power input voltage and ST-BY 5V	Revised date		A18

For '10 models, there is no voltage out for st-by purpose. When st-by, only 3.5V is normally on.





	24 Pin (Power Board ↔ Main Board)						
	SMAW200-H24S (YEONHO)						
1	Power on	2	24V				
3	24V	4	24V				
5	GND	6	GND				
7	GND	8	GND				
9	3.5V	10	3.5V				
11	3.5V	12	3.5V				
13	GND	14	GND				
15	GND	16	GND				
17	12V	18	Inverter On/off				
19	12V	20	Lamp : A-Dim LED : N.C				
21	12V	22	PWM Dim #1				
23	GND/P_DIM2 • Lamp SCANNING Model : PWM Dim #2	24	Error-out				

Standard Repair Process Detail Technical Manual Error Established B. Power error _No power 2010. 12 .14 symptom date LCD TV Revised Content A19 Checking method when power is ON

Check "power on" pin is high

date

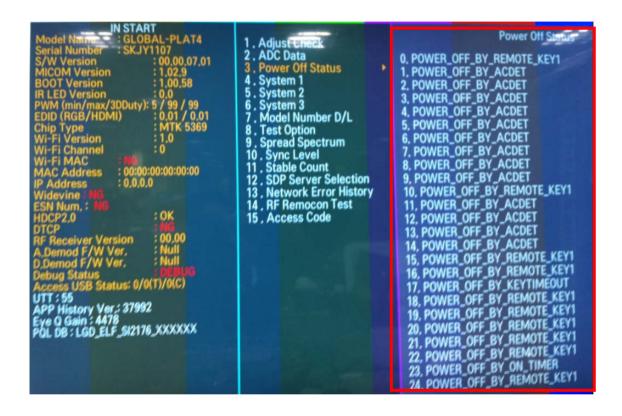


	24 Pin (Power Board ↔ Main Board)						
	SMAW200-H2	24S (YE	ONHO)				
1	Power on	2	24V				
3	24V	4	24V				
5	GND	6	GND				
7	GND	8	GND				
9	3.5V	10	3.5V				
11	3.5V	12	3.5V				
13	GND	14	GND				
15	GND	16	GND				
17	12V	18	Inverter On/off				
19	12V	20	Lamp : A-Dim LED : N.C				
21	12V	22	PWM Dim #1				
23	GND/P_DIM2 • Lamp SCANNING Model : PWM Dim #2	24	Error-out				

LCD TV

Error symptom	B. Power error _Off when on, off whiling viewing	Established date	2010. 12 .14	
Content	POWER OFF MODE checking method	Revised date		A22

<ALL MODELS>



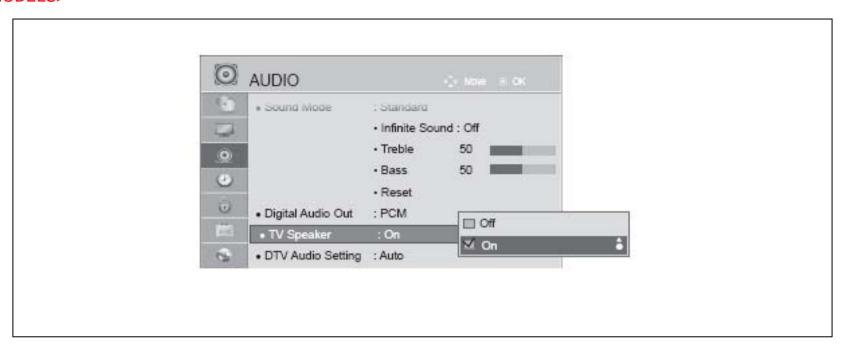
Entry method

- 1. Press the IN-START button of the remote controller for adjustment
- 2. Check the entry into adjustment item 3

Standard Repair Process Detail Technical Manual Error Established C. Audio error No audio/Normal video 2010. 12 .14 symptom LCD TV date Revised Content Checking method in menu when there is no audio **A24**

date

<ALL MODELS>



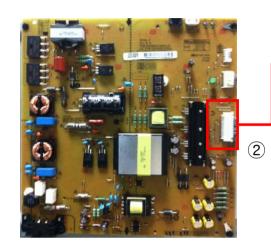
Checking method

- 1. Press the MENU button on the remote controller
- 2. Select the AUDIO function of the Menu
- 3. Select TV Speaker from Off to On

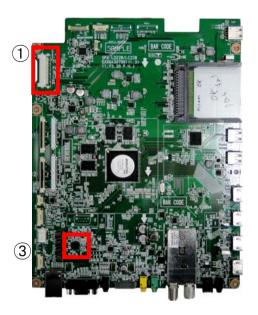
LCD TV

Error symptom	C. Audio error_No audio/Normal video	Established date	2010. 12 .14	
Content	Voltage and speaker checking method when there is no audio	Revised date		A25

<ALL MODELS>



	24 Pin (Power Board ↔ Main Board)					
	SMAW200-H24S (YEONHO)					
1	Power on	2	20V (24V)			
3	20V (24V)	4	20V (24V)			
5	GND	6	GND			
7	GND	8	GND			
9	3.5V	10	3.5V			
11	3.5V	12	3.5V			
13	GND	14	GND			
15	GND	16	GND			
17	12V	18	Inverter On/off			
19	12V	20	Lamp:A-Dim LED:N.C			
21	12V	22	PWM Dim #1			
23	GND/P_DIM2	24	Error-out			

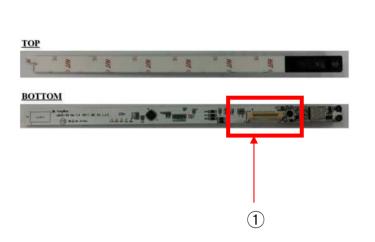


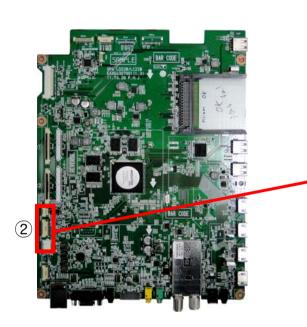
Checking order when there is no audio

- (1) Check the contact condition of or 24V connector of Main Board
- 2 Measure the 24V input voltage supplied from Power Board (If there is no input voltage, remove and check the connector)
- ③ Connect the tester RX1 to the speaker terminal and if you hear the Chik Chik sound when you touch the GND and output terminal, the speaker is normal.

Standard Repair Process Detail Technical Manual Error D. Function error No response in remote controller, Established 2010, 12,14 symptom key error LCD TV date Revised Content **A27** Remote controller operation checking method date

<ALL MODELS>





P4102	
1	SCL
2	SDA
3	GND
4	KEY1
5	KEY2
6	St 3.5V
7	GND
8	RED LED
9	IR
10	GND

(3)

Checking order

- Check IR cable condition between IR & Main board.
 Check the st-by 3.3V on the terminal 6.
- When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.

Standard Repair Process Detail Technical Manual LCD TV | Sequence of the Vcom adjustment | Sequence of the

1. Case

- LCD module change
- T-Con board change

2. Equipment

■ Service Remote controller

3. Adjust sequence

- Press the 'adj' key
- select V-COM
- As pushing the right or the left button on the remote controller, And find the V-COM value Which is no or minimized the Flicker.

(If there is no flicker at default value, Press the exit key and finish the VCOM adjustment.)

- Push the OK key to store the value. Then the message "Saving OK" is pop.
- Press the exit key to finish V-COM adjustment.

